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MAY 1992

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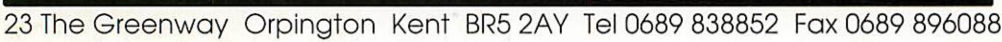
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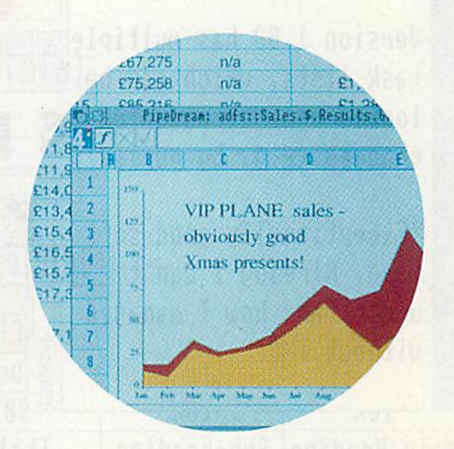
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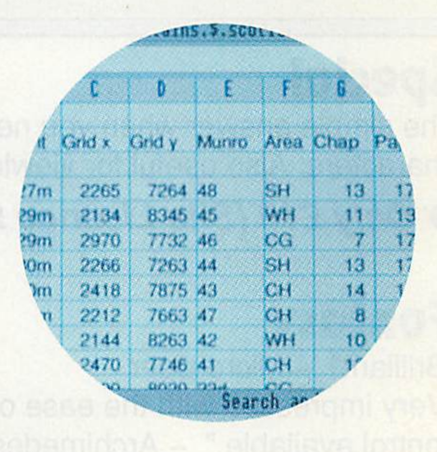
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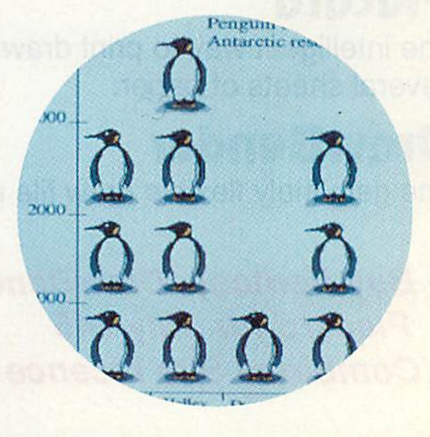
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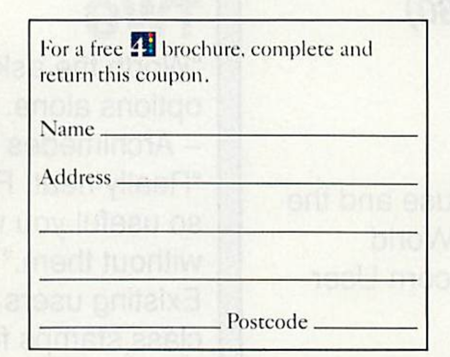






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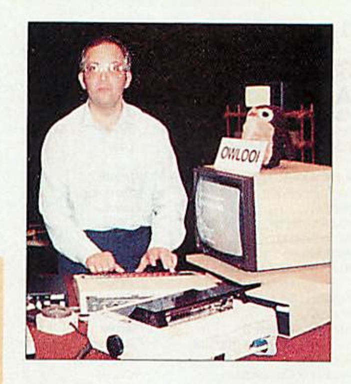
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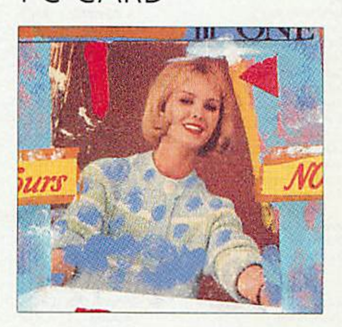
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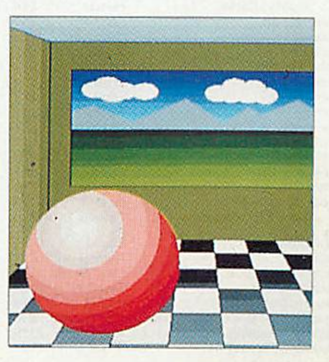
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SkyHunter	*Longman*	£23
smArt	*4mation*	£50
•smArt Dinosaurs / Faces / Faces (French) / Faces (German) / Fashion / Heraldry / Homes / Homes (French) / Homes (German) / Leisure / Leisure French) / Leisure (German) / Look Smart / Modern Languages / Smartoons / Trees and Gardens – each	*4mation*	£15
smArtFiler	*4mation*	£32
Snippet	*4mation*	£26
SolidCAD	*Silicon*	£115
SolidsRender	*Silicon*	£115
SolidTools	*Silicon*	£269
Spark	*David Pilling*	£5
Sparkle	*Morley*	£59
Special	*ICS*	£10
– site licence		£30
Speech!	*Superior*	£14
Spelling week-by-week	*Chalksoft*	£19
Spitfire Fury	*Fourth Dim*	£POA
Splice	*Ace*	£31
Sporting Triangles	*CDS*	£20
•Sports Day	*Selective*	£22
Square Route	*Computer Eyes*	£16
Step by Step Guides (videos):	*Pedigree*	
1 Up & Running, 2 Text Processing, 3 Data Handling, 4 Art & Graphics	each	£12
Stock Management	*Minerva*	£78
Studio24Plus Version 2, age 11+	*EMR*	£139
Studio24Plus Version 3, age 12+	*EMR*	£210
Super-Dump	*Silicon*	£20
Superior Golf	*Superior*	£14
Super-Plot	*Silicon*	£28
Supersounds	*CIS*	£15
Supersounds 2	*CIS*	£12
•Swiv	*Krisalis*	£21
System Delta Plus II	*Minerva*	£50
– Reference Guide	*Minerva*	V0 £25
Tactic	*Eterna*	£15
Talisman	*Minerva*	£12
Target Maths	*Triple R*	£14
TechWriter	*Icon*	£245
Telling the Time, age 3-12	*Rainbow*	£7
Thundermonk	*Minerva*	£12
Timetabler	*Minerva*	£549
TimeWatch	*Mitre*	£24
Tiny Logo + Tiny Draw	*Topologika*	£27
•Titler	*Clares*	£120
Toolkit Plus	*Clares*	£35
Tools Graphics, drawfiles	*Micro Studio*	£23
Top Banana	*Hex*	£22
•Touch Type	*Iota*	£39
Tower of Babel	*Cygnus*	£17
•Trace	*David Pilling*	£5
Tracer	*Midnight*	£46
Tracker	*Vertical Twist*	£37
Transport, drawfiles	*Micro Studio*	£25
Trivial Pursuit	*Domark*	£22
Turbo Type	*CIS*	£20
Tween	*Ace*	£29
Twin	*Acorn*	£24
Twin World	*UBI Soft*	£14
TWO (Task and Window Organiser)	*ICS*	£19

– site licence		£60
U.I.M	*Fourth Dim*	£23
Utility Disc 1	*Data Store*	£13
Utility Disc 2	*Data Store*	£13
Utility Disc 3	*Data Store*	£7
Utility Collection	*Data Store*	£21
Vector	*4mation*	£POA
View»Mac 3	*Human*	£65
– Arc/Mac Cable	*Human*	£24
Vox Box	*Clares*	£47
Waterloo		£25
White Magic	*Fourth Dim*	£14
White Magic 2 + Designer	*Fourth Dim*	£14
Wimp Game	*Fourth Dim*	£12
Wonderland	*Virgin*	£24
Words and Pictures	*Chalksoft*	£17
World Championship Boxing Manager	*Krisalis*	£20
World Geography Maps, drawfiles	*Micro Studio*	£23
World Map Study, age 7-16	*EMR*	£42
World Wildlife, sprites	*Micro Studio*	£16
Worra Battle	*Oak*	£13
WorraCAD	*Oak*	£75
Worra Plot	*Oak*	£24
X-Fire	*Fourth Dim*	£17
Z88: A Dabhand Guide	*Dabs*	V0 £15
Z88 PipeDream Guide	*Dabs*	V0 £15
Zarch	*Superior*	£14
Zelanites	*Micro Power*	£14

HARDWARE

A5000 COMPUTERS

2Mb Hard Disc Colour System	*Acorn*	£1499
– as above + Learning Curve		£1530

(Finance & special purchase schemes available)

MEMORY

Fitting extra unless otherwise stated
† Fitting easy ‡ Fitting needs expertise

A3000 2 Mb Non-upgradable †	*IFEL*	£55
A3000 2 Mb Upgradable †	*IFEL*	£63
A3000 4 Mb †	*Atomwide/IFEL*	£149
A310 2 Mb Upgradable soldered ‡	*IFEL*	£99
– as above + MEMC1a		£149
– as above + MEMC1a + fitting		£200
A310 4 Mb soldered + MEMC1a ‡	*IFEL*	£225
– as above + fitting		£277
– as above + fitting + OS3 carriers		£298
A5000 2 - 4 Mb Upgradable †	*Atomwide*	£109
A5000 2 - 8 Mb including fitting	*Atomwide*	£500
A5000 4 - 8 Mb including fitting	*Atomwide*	£391
A540 4 Mb †	*Atomwide*	£268

MISCELLANEOUS

•386C PC Expansion Card, 1 Mb	*Aleph One*	£463
•386C PC Expansion Card, 4 Mb	*Aleph One*	£579
4-slot 4-layer Backplane	*IFEL*	£59
9060S Monitor	*Eizo*	£450
9070S Monitor	*Eizo*	£640
A300/400 Fan kit	*ICS*	£15
A310 RISC OS Carrier Board ‡	*IFEL*	£25
A5000 Fitting Kit for second hard disc	*ICS*	£15
ARM3 ‡		£249
Clares Micro Mouse	*Clares*	£26
Dongle Dangle with screw fittings	*ICS*	£6
Fan filters (pack of 10)	*ICS*	£4
FaxPack	*CC*	£289
Monitor Stand for A3000	*ICS*	£18
TouchWindow	*Lindis*	£234
Whisper Fan Quietener	*ICS*	£15

HIGH DENSITY 3½" FLOPPY DISCS

Pack of 10		£10

PRINTERS

ArcLaser	*Calligraph*	£895
ArcServer	*Calligraph*	£985
Bubble Jet BJ-10e	*Canon*	£205
Bubble Jet BJ-300	*Canon*	£360
Bubble Jet BJ-330	*Canon*	£405
Laser Direct HiRes4 with 50-sheet tray	*CC*	£895
– 250-sheet Paper Cassette		£99
Laser Direct HiRes8	*CC*	£1280
Laser Direct LBP-4 Card	*CC*	£319
Laser Direct Qume	*CC*	£749
LBP-4	*Canon*	£659
Refill toner cartridge for Canon EPS		£50
New toner cartridge for Canon LBP-4		£59

SCANNERS, DIGITISERS

ArcScanner including Epson GT-4000	*Clares*	£1660
FaxScan	*Spacetech*	£94
FX9600AT + Maintenance	*Amstrad*	£376
Hawk V9	*Wild Vision*	£199
– A3000 version	*Wild Vision*	£278
Image (colour)	*Irlam*	£589
Image Scanner	*Iota*	£389
– Colour upgrade	*Iota*	£98
i-Scan 200	*Irlam*	£539
i-Scan 400	*Irlam*	£589
Pineapple Colour Video Digitiser	*Pineapple*	£195
– A3000 boxed	*Pineapple*	£230
Scan-Light A4	*CC*	£277
– with Sheet Feeder	*CC*	£370
Scan-Light Junior	*CC*	£128
– A3000 internal	*CC*	£128
Scan-Light Junior 256	*CC*	£199
– A3000 internal	*CC*	£199
Scan-Light Professional	*CC*	£825
– as above + SCSI interface	*CC*	£910
SnapShot Colour Video Digitiser	*Lingenuity*	£195
– A3000 version	*Lingenuity*	£275
Spectra	*RISC*	£545
– A3000 Internal	*RISC*	£545
– A3000 External	*RISC*	£565
Video Digitiser	*HCCS*	£49

I^2C PRODUCTS

AnDi Oddule	*Baildon*	£49
I^2C Adaptor (needed unless you already have an I^2C socket)	*Baildon*	£10
I^2C SWI (enhanced IIC_Control)	*Baildon*	£15
– bought with Oddule		£5

KEYBOARD COVERS

Seal 'n Type (spill-proof)		
– Archimedes / A5000	*Kador*	£14
– A3000	*Kador*	£14

FUNCTION KEY STRIP ORGANISER

Arckey	*ICS*	V0 £3
– pack of 4		V0 £10

HOW TO ORDER

VAT: UK customers please add 17.5% to the total price, except for the zero-rated items marked V0. Our VAT number is 595 7258 84.

CARRIAGE IS FREE WITHIN MAINLAND UK IF YOU PAY ON ORDERING. Remember this when you compare prices!

Overseas carriage: If you are paying by credit card we will add airmail and insurance at cost. Otherwise please add £6 (Europe) or at least £12 (elsewhere) for each software item and send a pounds sterling bank draft payable in England, or Eurocheques for not more than £100 each.

Credit cards are welcome. We do not charge your account until your order has been fulfilled. The name and address for delivery of goods should be as known to the credit card company. If you are leaving an order on our answering machine please include your telephone number, the expiry date of your card, and your calculation of the total payment due.

Official orders are welcome. Payment is due in 14 days. Invoices are subject to carriage and late payment charges.

Site licences: please enquire if no price is shown.

All products, prices and specifications are offered in good faith and are subject to change without notice. Your order will receive our attention immediately, but suppliers sometimes keep us waiting. Goods are guaranteed but we do not supply them on approval.

Thinking IDE?

We've got a brand new



After 1½ years' experience in selling IDE products for Acorn computers (more than twice that of any rival), we are pleased to announce a new release of the IDE Filing System by ICS. Completely rewritten in the UK, the new ICS IDEFS offers improved speed and added features such as password protection.

Existing ideA users can upgrade for just £15 + VAT, returning the old eprom afterwards. Please specify your interface type.

New customers should please telephone ICS or contact their local dealer for information on our complete range of IDE hard disc upgrades.

FREE Compression WORTH £57 !

when you buy direct or from participating dealers.

You may well find cheaper suppliers (and less advanced products). But our advice is

Don't take risks –



It's where the ideA came from!

AUTHORISED ACORN DEALER

ICS (Ian Copestake Software)

Dept B30, 1 Kington road, West Kirby, WIRRAL, Merseyside, L48 5ET

Tel: 051-625 1006 Fax: 051-625 1007

A3000 ON OFFER AT TESCO

IF YOU want a 'free' Acorn computer for your school, ask the staff and pupils (or their parents) to shop at Tesco.

That's the message behind a six week voucher redemption scheme – called 'Computers for Schools' – being organised by Tesco, one of the UK's largest supermarket chains, in conjunction with Acorn Computers. Schools all over the country are being invited to register with the scheme, which runs for six weeks from April 6.

Tesco will be giving customers a special voucher for every £25 spent in one of its 392 stores. In each participating school, teachers, pupils, parents, relatives and friends will be encouraged to collect the vouchers, which are redeemable against a selection of Acorn hardware and related software items listed in a special catalogue.

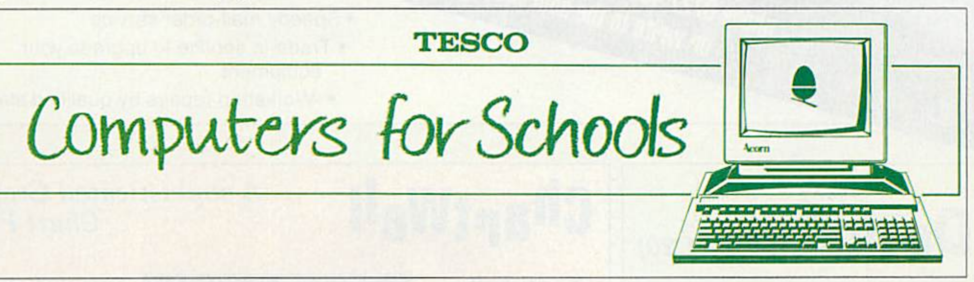
The choice ranges from a new Acorn A5000 colour system (4000 vouchers), to various items of software which require as few as 200 vouchers. Titles listed in the catalogue include *Impression 2* (1300 vouchers) and *Magpie* (800 vouchers).

As an example, if a school of, say, 200 pupils sets out to use the voucher scheme to obtain a BBC A3000 computer (worth 3000 vouchers), the parents of each pupil would have to spend £62.50 per week during the promotion for the school to obtain the required number of vouchers.

'That should not be a daunting task,' said Tesco's Jenny Gilmore, 'since £61 is the average weekly spend in our stores.' The target is even more attainable if relatives and friends are also encouraged to collect the vouchers.'

Acorn is arranging demonstrations in over 100 Tesco stores during the promotion and around 80 Acorn dealers will be participating.

To register your school in the voucher scheme, tel: (0923) 818881.



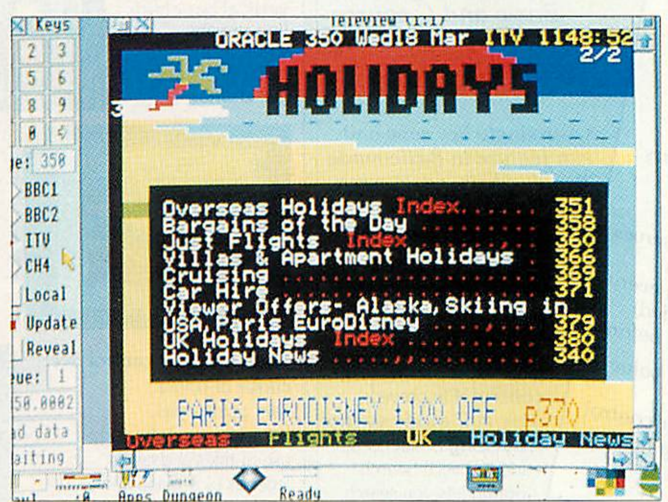
TELEVIEW GIVES INSTANT ACCESS

NETWORKING specialist SJ Research has launched a broadcast teletext server and Econet bridge to enhance Acorn Econet networks.

The Teleview teletext server breathes new life into an BBC micro and original matching Acorn teletext adaptor. It is also compatible with the later teletext adaptor produced by GIS. Once fitted with Teleview software and attached to an Econet network, any user of a BBC or Archimedes can have virtually instant access to Ceefax or Oracle teletext information. Fastext is supported and frames can be stored and compiled into a local database accessible via the network.

A pre-production version of Teleview was installed on the network at *BBC Acorn User*'s offices for several months and Teleview proved to be extremely popular, peaking noticeably when news headlines get exciting – for example, during the recent Budget Day speech. Teleview costs £69 plus VAT.

The Econet Bridge is an Acorn-approved redesign of the original Acorn Bridge unit. New features include a doubling of processing speed to 4MHz, implementation of data collision detection circuitry to lessen the chance of lost information, an LCD display, improved control panel and a built in clock box. It costs £245 plus VAT. For further information, contact SJ Research on (0223) 416715.



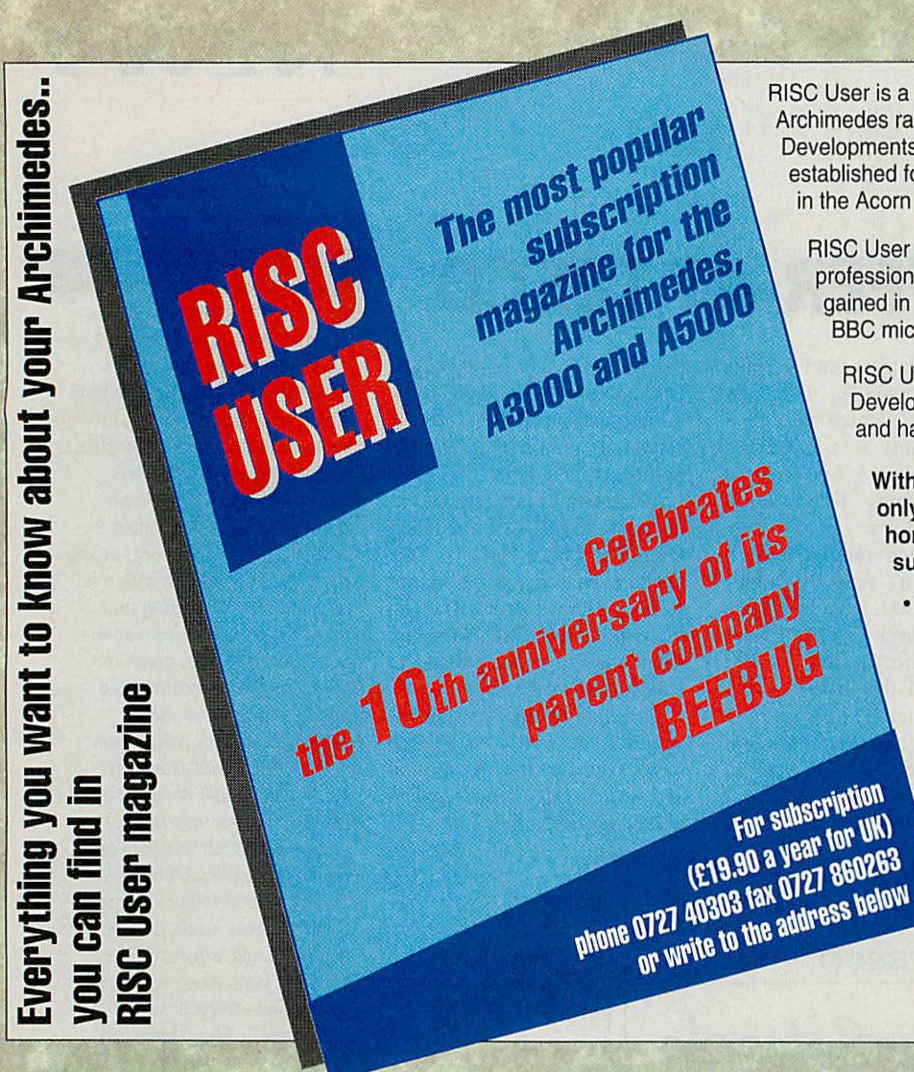
Tune in to the latest information with SJ Research's Teleview server

NEWS IN BRIEF

● **A PROFESSIONAL** video titling package has been introduced for the Archimedes by Clares. Called Titler, the program is both a titler and sequencer. The former enables the user to construct textual and graphic displays, while the latter strings them together and presents them sequentially. Outline fonts at any point size can be used with a full range of text formatting functions. Graphics files from all the popular Archimedes graphics packages can be incorporated into screen designs: the sequencer accepts Titler's own display file format as well as Euclid and Render Bender 2 animation files. For very large presentations, on-line data compression is optional. Effects include fade in/fade out, unroll, dribble, blinds, scroll, drag, etc. User-definable effects can be added as well, along with sampled sound effects or soundtracker music files. TItler costs £127 plus VAT. Contact Clares on (0606) 48511.

● **DELEGATES** at an international conference on the use of computers in engineering education, have been told how the superior graphics capabilities of Archimedes computers has enabled the teaching of flight mechanics to university undergraduates. Manchester University's Dr Neil Stevenson, who presented a paper called 'Teaching Flight Mechanics Using Archimedes Computers,' said that his students could 'fly' various aircraft types using Archimedes as simulators. Aircraft simulated ranged from Cessna light aircraft to Jumbo jets. Students have control over 16 key parameters which can affect the performance of the aircraft. However, this is no ordinary flight simulator as variables include technicalities like sinusoidal gust loadings and structural oscillations.

● **DON'T** forget to put a note in your diary for the BBC Acorn User Show, due to take place at Wembley Exhibition Centre from October 16 to 18. Exhibition stand details are available from Safesell Exhibitions on (0737) 814084.



RISC User is a high quality magazine devoted totally to the Archimedes range of computers. It is published by RISC Developments, formed last year from BEEBUG, which has been established for over ten years as one of the foremost companies in the Acorn market.

RISC User is produced by a dedicated and enthusiastic professional team which benefits from10 years of experience gained in publishing the popular BEEBUG magazine for the BBC micro and the Master 128.

RISC User can also call upon BEEBUG's (now RISC Development's) considerable expertise as a major software and hardware developer for the Archimedes range.

With a RISC User subscription you will receive not only 10 magazines a year (delivered free to your home), but you will benefit from all the help and support a professional organisation can provide:

- Technical help with all RISC Developments' products and publications
- RISC Developments' own range of high quality hardware and software with special discounts for magazine subscribers
- Showroom with friendly professional staff, where you can try out the latest software and hardware
- Retail catalogue, mailed free to magazine subscribers, with regular updates on new products
- Tele-sales operation, where you can get technical guidance about your software or hardware requirements
- Speedy mail-order service
- Trade-in service to upgrade your equipment
- Workshop repairs by qualified staff

Following glowing reviews in the computer press ...
... a new version of **DeskEdit** *(V 1.20)*
has now been released

with even more features for text editing and word processing tasks, Basic and C source editing

Acorn User
...offers much to the user... a good deal of thought has evidently gone into its development...
... a worthwhile upgrade from Edit

Archimedes World
...replete with well thought out and flexible features... very attractive... remarkably inexpensive for what it offers... should prove very popular.

Archive
...a wonderful piece of software... deserves to be on everyone's icon bar... Acorn would do well to provide it free with every machine it sells... so much (is provided) that you wonder how you managed before.
...macros are...a boon and of great value when writing a program... a truly marvellous set of page and printer control options are included... Everything I wanted was there with clear instructions for use.DeskEdit is a must.

A new ***single key save-and-run feature in Basic mode*** permits virtually instantaneous testing of programs and applications as you edit them.

The ***improved procedure and function browser*** now lets you browse in both directions

In text mode, ***wordwrap control*** is improved, while in ***C mode syntax checking*** is extended, and a special Search option lets you search for function definitions.

Other ***new features*** are: • dynamic date insertion • Left and Right Justify • bracket matching • Align Columns and • the Char Info option.

DeskEdit

is the ultimate all-purpose editor for the Archimedes, with special features for plain text, Basic and C source.
Edit your Basic programs on the desktop and test them interactively with a single key press.

DeskEdit + a 48 page manual + a function keystrip Price **£24.95** inc + £1.50p&p Code **PEDTb**

Existing users may upgrade to V. 1.20 by sending their original disc, together with £2.00 and SAE marked **DeskEdit Upgrade 1.2.**

ChartWell ***A sophisticated Graph and Chart Package***

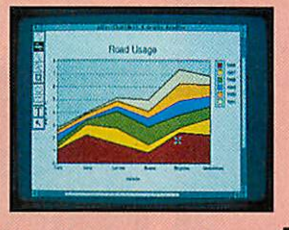
ChartWell offers **24 different graph types**: horizontal and vertical bar charts line graphs scatter charts polar plots and pie charts.

Data can be imported from other applications, such as spreadsheets, databases, or created with a suitable editor as a text file. **Output** is in standard Draw format for import into Draw or any other application, DTP for example.

A variety of display options:
flat or 3D bar and pie charts,
user choice of angle for 3D pie chart display,
clustered, stacked or layered bar charts,
scatter graphs with choice of curve fitting techniques, regression lines and correlation coefficients, and use of error bars,
line graphs with choice of normal, cumulative area or stacked area displays.

Complete user control over:
choice of colour,
data point styles,
bar widths and spacing,
use of titles and labels,
legends to provide a key,
graduated/shaded backgrounds,
scales and tick marks, etc.

Use of **'style sheets'** allows a set of options to be saved with data for future reference. User choice of start-up options.



A single chart or graph can **display up to 6 different data sets**, including up to six pie charts in a single display.

Flexibility - you can select only part of the data for display, or change the order of display - i.e. whith bar charts data can be arranged in ascending order.

Chartwell and manual
Price **£29.95 inc** +1.50 p&p
Code **PCHWa**

RISC Developments Ltd. 117 Hatfield Road, St Albans, Herts, AL1 4JS. Tel. 0727 40303 Fax 0727 860263

ACORN AT CEBIT

ACORN had a small but busy stand at the recent CeBIT fair in Hannover, Germany. CeBIT is an annual European information technology exhibition which attracts about half a million visitors during its week-long duration.

Acorn's stand, a joint effort between the company's international division and its German agent, GMA, featured the whole range of Archimedes computers running German language versions of Archimedes software.

Despite a slight hiccup which involved a last minute stand relocation to a different hall, German Archimedes fans descended on the exhibition in large numbers. The rival Commodore Amiga and Atari ST computers are well-established in Germany with several hundred thousand installed examples each, compared with up to 5000 Archimedes.

Hoards of Amiga and ST (as well as PC) users were stopped in their tracks by Archimedes' demonstrations on the stand, many apparently not believing that some of the demos were possible without a fair degree of cheating.



The A5000 on Acorn's CeBit stand

Flying the Acorn flag at CeBIT were Acorn's Richard Sumner, Aleph One's Nick Van Sommeren and Computer Concepts' Gordon Taylor.

CANON INCOMPATIBLE?

CANON's new BJC-800 colour inkjet printer is not compatible with the parallel ports of standard Archimedes computers. 'There is at present some incompatibility on the parallel interface between the Archimedes and the Canon BJC-800,' a Canon UK spokesman told *BAU*.

The good news is that Computer Concepts has found a way around the problem and Acorn is also working on a solution. The printer would normally need special non-standard drivers to get the best out of its colour capabilities, but apparently even in standard Epson LQ emulation mode, it refuses to operate with any Archimedes.

But the printer has been churning out impressive Archimedes-generated colour prints at Computer Concepts, thinly disguised as that company's ColourDirect printer package. It seems that a combination of a ColourDirect printer driver and a parallel port anti-piracy hardware key ('dongle') can cure the incompatibility problem.

Low-level Risc OS kernel parallel port routines seem to be causing the difficulties. As ColourDirect's driver bypasses the Risc OS kernel, there is no problem.

Some Archimedes using Acorn printer drivers have been able to coax the BJC-800s into life simply by attaching CC's dongle, like the one supplied with its *Impression* DTP package.

Canon says it has not encountered compatibility problems with any other computers. At the same time, Acorn points out that all other printers work perfectly well with the Archimedes.

Acorn is thought to be developing a software patch for Risc OS 3 users and is also investigating whether there is a solution for Risc OS 2 users via an upgrade path.

GENESIS GUIDE

A GUIDE for users of Oak Solution's *Genesis 2* hypermedia package who want to write their own *Genesis* applications has been published.

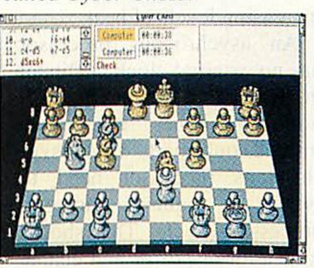
The *Genesis Script Language Book* is described by Oak Solutions' David Tee as 'vital reference' for *Genesis 2* applications' writers. The book covers topics like page scripts, action scripts, actions and events, menus, dialogue boxes, procedures, functions, frames, graphics and lists.

Total sales of *Genesis* packages, including *Genesis 1 and 2* and *Genesis Plus* recently passed the 40,000 mark, making it one of the biggest selling Archimedes software packages yet. *Genesis* is currently bundled with Acorn's Learning Curve systems.

For further information, contact Oak Solutions on (0274) 620423.

NEW CHESS PLAYER

'THE DEFINITIVE chess playing program' is how The Fourth Dimension describes its latest release for the Archimedes, called *Cyber Chess.*



The key features are: a near complete 3D simulation of the game, with animation used to move the pieces smoothly around the board; operation from the desktop; full implementation of applicable chess laws, including *en passant*; and multi-level play, appealing to both beginners and advanced players.

Cyber Chess costs £49.95 and will be available from June. Contact The Fourth Dimension on (0742) 700661.

NEWS IN BRIEF

● **ACORN** co-founder Hermann Hauser's revolutionary Active Book Computer may have undergone a dramatic design shake-up since its acquisition by an AT&T subsidiary last year. But he has told BAU that, contrary to reports, the special low-power version Arm Risc chip (as used in the Archimedes) which was specially developed for the Active Book has not been discarded.

It had been widely speculated that the Arm was low down on AT&T's shopping shopping list when it took over the Active Book Company. Other AT&T companies are currently in the forefront of PC-based 'book-computers' or keyboard-less pen-computers. According to Hauser the Arm may yet see the light of day in a low-cost personal version of the Active Book, while PC chips will be used in more business-oriented versions.

● **BEEBUG**, like the BBC micro, is officially celebrating its tenth anniversary. Originally set up in April 1982 as a user group to support the then new BBC micro, Beebug grew fast with subscriptions to its club magazine rising by an astonishing rate of a thousand per month in the Beeb's heyday. Then, Beebug was best known for its popular Rom-based software like Exmon, Dumpmaster, Command and the Master Rom. The best-selling Masterfile database for the Beeb was also from Beebug. A new Archimedes version of Masterfile is scheduled for release later this year.

Beebug's growth through the years has meant two moves to larger premises and the setting up of an associate company, Risc Developments Ltd, to cater for the Archimedes after it was launched by Acorn in 1987.

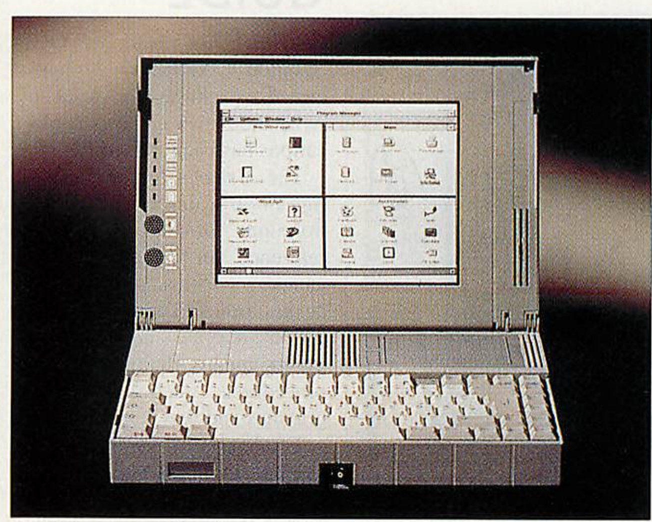
When you look at what Beebug and Risc Developments are up to today, producing packages like Ovation, Hearsay and Desk-Edit, etc, plus hardware-based scanner cards, memory upgrades and IDE hard drive interfaces, it all seems like another age when Beebug first type-written club magazine dropped through our news editor's letterbox ten years ago...

IS ARC PORTABLE READY?

HOPES that the elusive portable Archimedes will make a public appearance fairly soon were boosted recently by Acorn's managing director, Sam Wauchope. He confirmed exclusively to *BAU* at recent reception to celebrate a decade of the BBC's computer literacy project, that the Archimedes laptop would be seen publicly 'within the next two to three months.'

The portable was meant to be shown at the BETT show last January. 'It was there,' said Wauchope, 'and we showed it to selected people.' One possible reason for the non-appearance of the portable in public had been attributed to Apple's introduction of its acclaimed Macintosh PowerBook portable range at the end of last year.

The PowerBooks have neatly built-in tracker-ball pointer controls, while our spies tell us the prototype Archimedes portable relies on a standard mouse. At least Wauchope's comments can be seen to squash scurrilous rumours that the portable project had been scrapped.



Could the new Archimedes portable look like this Olivetti Notebook?

BAU sources say that the Archimedes portable is a genuine notebook-sized machine rather than a first-generation 'luggable.' Our hunch is that the new machine has an Olivetti/Triumph Adler notebook PC casing (see picture) although there is no sign of the neat mouse-pad pointer control those PCs normally have. Internally, the portable may have what has been described as an 'incredibly small ten-layer motherboard', scotching speculation that the A5000's internal boards, which bear unused PC peripheral interfaces, have been re-housed in the new machine.

As always, watch this space for the full details.

NEW ARM PROJECT

FASTER processing using less power is the aim of a new chip development project headed up by Professor Steve Furber, one of the original designers of the Arm Risc microprocessor which lies at the heart of all Archimedes computers.

The European Eureka-funded research project will investigate potentially revolutionary technology which could lead to a world-beating processor based on the Arm chip. Furber, now Professor of computer engineering at Manchester University, hopes a new form of 'asynchronous' processor architecture will avoid the looming hurdle of speed versus power consumption limits.

The theory goes that the bigger and faster conventional processor chips get, the less reliable their clock-driven architectures will be. At the same time, they will use more power as well as generate increasing levels of heat.

An asychronous processor has no external clock to flip all the transistors on the chip millions of times a second. Instead, only parts of an asynchronous processor need to switch as required during a processing cycle. This should save a lot of power and enable the chip designer to optimise the chip's operation and make it go faster.

The Arm is already establishing a reputation for its low power consumption, ideal for present day portable computer applications, but Furber has set a goal of a ten-fold reduction in power consumption for an asynchronous version of the Arm. Furber chose the Arm chip as the test-bed because, 'you could say it is the chip I'm most familiar with...'

EMULATOR RELEASED

VERSION 1.8 of the *Acorn PC Emulator* (AKA70) incorporating VGA graphics support and an expanded memory, is released this month.

This new version of the emulator includes MS-Dos 3.30, a revised manual and MS-Dos CD-Rom extensions. It can be configured to run Dos applications making use of VGA – this includes many of the CD-Rom titles listed in the NCET CD-Rom scheme for schools.

The new version costs £99 plus VAT. An upgrade for existing version 1.6 and 1.7 emulator owners will be available from June until September 92. It costs £9 plus VAT which includes a site licence for educational institutions. For details contact Acorn on (0223) 245200.

NEWS IN BRIEF

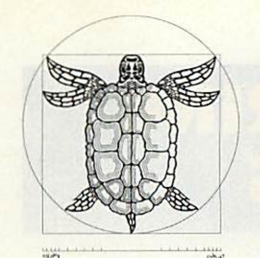
● **COMPUTER** Concepts has used its LaserDirect technology to develop the fast printer driver incorporated in the new Canon-based ColourDirect printer. In a logical next move, CC is to apply this technology to Canon's admired and affordable, but slow, BJ10e/BJ10ex portable ink-jet printers.

In graphics mode, which is required for reproducing RisC OS fonts, it can take around ten minutes to print a complex page via standard Acorn printer drivers. CC's new driver promises to reduce printing times by one-third. Normally, the parallel printer port is not the bottleneck between the printer and your Archimedes, when using Acorn or Acorn-based printer drivers. What CC has done is speed up the Risc OS font rendering by using a highly optimised rendering system called Fast Text, originally developed for the LaserDirect. Canon BJ10 printers, running the prototype 'turbo' drive, currently finish printing pages in about three minutes.

Like ColourDirect, the Risc OS kernel is by-passed so the printer port is directly address. On top of that, printing is done in the background, unlike Risc OS 2 printer drivers. Charles Moir at Computer Concepts has not fixed a price for the new driver, but hinted that pricing would be no more than £50. Moir is also likely to bundle the driver with a printer, following the LaserDirect and ColourDirect tradition. Contact Computer Concepts on (0442) 63933.

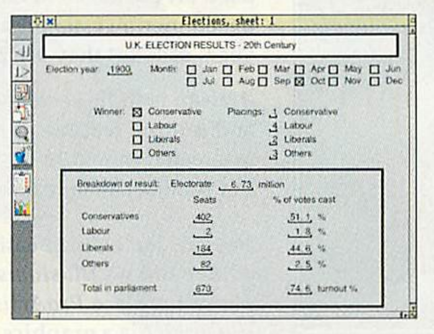
● **IF YOU** are an individual or company making news in the Acorn marketplace, why not let our readers know? You can contact our news editor, Ian Burley, by writing to him at BBC Acorn User, Redwood Publishing, 20-26 Brunswick Place, London N1 6DJ. Tel: 071-490 1444, or fax 071-490 0494. Or you can contact him via electronic mail, for example: iburley@compulink.co.uk (CIX/Internet), on Arcade BBS #626 (Fidonet mail) and Prestel MBX 015084817.

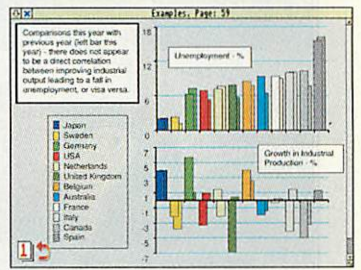
All ideas, comments and suggestions, not to mention News, will be gratefully received.



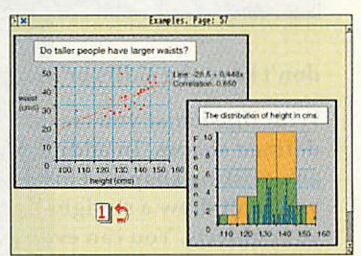
PinPoint

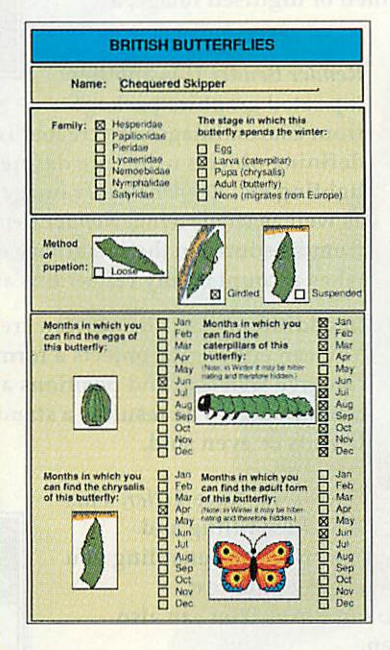
> "The ease with which data collection may be organised and implemented is a joy."
>
> **Frank Jukes, Micro User, January 1992**

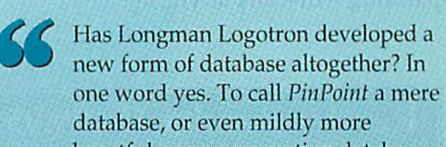




> "*PinPoint* is certainly a new generation database, making the handling of data as easy as it should be. Its concept and execution is brilliant — data handling is about collecting data efficiently, and that is what *PinPoint* does. *PinPoint* is powerful yet simple to use and will take educational data-handling into a new era."
>
> **Dave Futcher, BBC Acorn User December 1991**

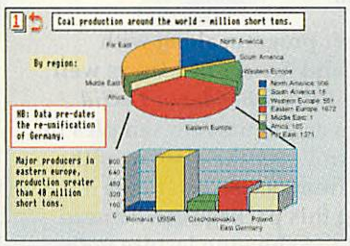






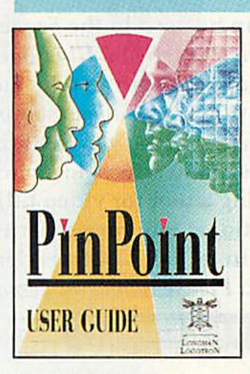
> "Has Longman Logotron developed a new form of database altogether? In one word yes. To call *PinPoint* a mere database, or even mildly more boastful, a new generation database, is to diminish what in truth is a revelation."
>
> "The scope and variety of *PinPoint* is quite astonishing. The sheer variety, the power, the complexity of this program is astounding. The analysis and display aspects are both powerful and attractive enough to operate in both an educational and business environment. Databases will never be the same after this."
>
> **Duncan Evans, Archimedes World December 1991**

> "*Pinpoint* takes databases into a new dimension in several ways. First, form design. *PinPoint* is about as adaptable as the best desktop publishing package when it comes to creating the form upon which information will later be entered and stored."
>
> "When its abilities to produce statistics, charts and diagrams (with more ease and speed than I would have believed possible), and to print the results in attractively designed page format is considered too, then it becomes an essential purchase for anybody wishing to collect, analyse and present information."
>
> **Chris Davies, Times Educational Supplement, November 1991**

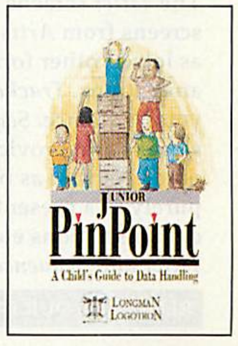


Longman Logotron
124 Science Park
Milton Road
Cambridge CB4 4ZS.

Tel. (0223) 425558
Fax (0223) 425349



PinPoint for the Acorn Archimedes is priced at £99. A Site Licence costs £400.



A special version for primary schools is priced at £24. A Site Licence costs £72.

GRAPHIC PROGRAMS TO BRING LIFE TO YOUR PICTURES

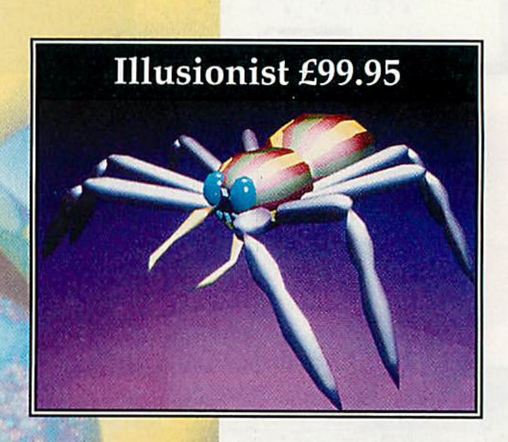
ProArtisan £105



First there was the *Artisan* and *ProArtisan* series – still the most widely used art packages in education today. They feature an intuitive icon based menu system that has proved usable by children as young as three years old. Yet they are powerful enough to be used by serious artists.

Artisan is in its second generation *(Artisan II)* and provides many useful and unique features. This is the one for younger children and anyone interested in textile design. ProArtisan is a more sophisticated package but retains the familiar interface of Artisan II – an easy upgrade path.

Illusionist £99.95



No, this isn't a bird eating spider and no *Illusionist* doesn't replace *ProArtisan*. *Illusionist* is a graphics package for those who don't have the skills or inclination for free format painting.

With *Illusionist* you create a wire frame outline of your image using pre defined shapes. In addition you can define your own shapes or distort any existing shapes. This makes it very easy to generate images even if you can't draw a straight line. You can assign colours and textures to your objects. You can even give them texture maps. A texture map is any Mode 12 or 13 screen. So you can use a scanned or digitised image, a painting – literally anything!

Render Bender II £99.95



NEW REDUCED PRICE

Render Bender II is another top rated graphics package from Clares. Images are created in a similar way to *Illusionist* by defining objects using pre defined shapes. You then add colour, texture, lighting etc. *Render Bender* images can include glass and mirror objects as well as shadowing. *Render Bender* actually calculates the path of light from its source to the imaginary eye at the viewing position. This path takes account of any reflections and refractions.

In addition *Render Bender* can create animated sequences very easily. You can either give objects a formula to control their movement or you can give start and end positions and ask the program to 'in between' the other frames. The result is a stand alone animation that can be passed to friends or even sold.

Titler £149.95

This shows a graph from !Plot loaded into Titler.

Favourite TV Programmes

We can have Rubout boxes

Underlined text

Finally we have *Titler*. This is a video titling and sequencing package. The *Titler* program uses outline fonts enabling you to create text screens, credits etc. You can have any colour text, background, drop shadow, underline or rub out boxes. You can also include sprites and Draw files in your screen.

The *Titler* screens can be used in the *Sequencer* program along with screens from *Artisan, ProArtisan, Illusionist* and *Render Bender*, as well as lots of other formats. You can also include *Render Bender* or *Euclid* animations, *Tracker* tunes, *Armadeus* samples or Archimedes samples in your sequence. *Sequencer* gives you total control over the display of the screens and provides many effects to switch from one screen to the other. As well as being a tool for video titling this package can be used purely as a presentational tool for preparing and showing lecture notes, demonstrations etc. In fact all of Clares demos are now created using *Titler* and *Sequencer*. *Please request a demo disc that will illustrate the potential of these packages.*

REQUEST YOUR FACT PACK TODAY!

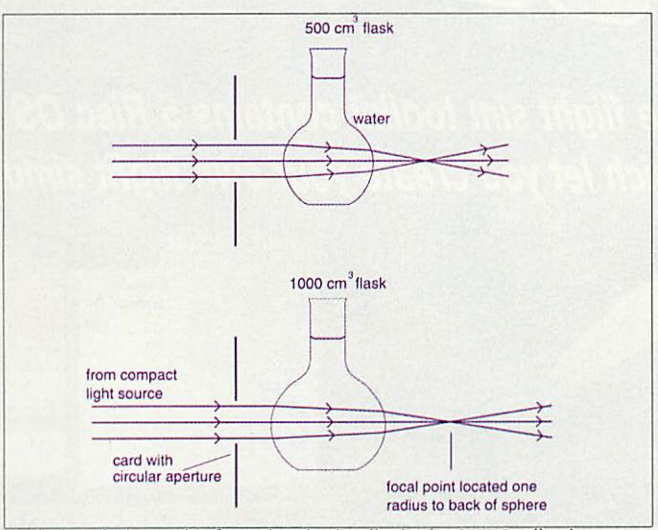
CLARES

98 Middlewich Road, Rudheath, Northwich, CHESHIRE CW9 7DA. Telephone: 0606 48511 Fax No: 0606 48512

BETTER GRAPHICS FOR SCIENCE

USING the *Draw* application on a BBC A3000 or Archimedes to create scientific worksheets or technical diagrams can be a time-consuming business, even to those familiar with the package.

However, help is at hand from the Scottish Schools Equipment Research Centre (SSERC) which produces graphics libraries for Arc users. The current libraries include clip art on a wide variety of science and technology subjects. The eight disc libraries cover circuit boards, electronics, interfacing, chemistry, physics, technology and utilities.



Optical analysis graphic from the physics disc in the SSERC collection

Using the quality graphics in the libraries provides a short-cut to producing detailed and complex diagrams, which can be used as resource material, or put into DTP documents.

Because the libraries come as separate subject area discs, it gives potential users the opportunity to buy what they want at a relatively low cost, and add to the collection as required. Useful hints and tips are included with the discs to help you make the most of the applications.

Each disc costs £10 for single users, plus £5 per disc if a site licence is required. Prices exclude VAT. Contact SSERC, 24 Bernard Terrace, Edinburgh EH8 9NX. Tel: 031-668 4421.

CASH BACK SCHEME

ACORN is celebrating the tenth anniversary of the BBC micro with a special cash back scheme for education.

The scheme offers schools a cash 'gift' of £50 for every BBC A3000 colour system purchased before the end of April 1992.

In a letter to educational establishments, Sam Wauchope, Acorn's managing director, said: 'In the ten years since the launch of the BBC B computer, we have forged the technological basis for educational computing in schools in the 1990s.

'The BBC A3000 is by far the best selling computer in education, with schools buying nearly three times as many as any rival machine.

'This year we feel we have a lot to celebrate. Acorn always has been, and remains, committed to the successful use of computers and networks in education.' Contact Acorn on (0223) 245200.

REPORTS OF SUCCESS

THE INFORMATION in Schools Initiative (ITIS) has successfully achieved its declared aims, according to an interim report from HM Inspectorate of Schools.

The report* assesses the current success of ITIS and presents a number of trends and issues worthy of consideration by those promoting or using IT in schools.

The main conclusions of the report are as follows:

- ITIS has made a significant impact in its first three years.
- The value of IT as an aid to learning across the curriculum is now widely recognised.
- IT is increasingly used to good effect in the classroom.
- Pupils respond to IT with enthusiasm, competence and originality.

However, the report highlights issues which require further consideration. In particular, the assessment of IT capability through SATs and classwork; the development of leadership as well as technical skills for key school staff involved with IT; the advent and availability of new technologies; and the maintenance and replacement of ageing computer equipment.

The allocation of computer hardware to schools became more sophisticated during the course of the initiative. Between 1988 and 1990, the provision of computers in schools rose from 2.5 to 4.3 per primary school and from 23 to 41 per secondary school. Part of this increase was attributed to ITIS' impact as a catalyst in obtaining additional funding from community or industrial sources. The report concludes that, as yet, few schools have achieved self-sufficiency in assimilating IT.

**The Impact of the Information in Schools Initiative 1988-1990* is published by the Department of Education and Science and is available from DES, Publications Despatch Centre, Honeypot Lane, Stanmore, Middx HA7 1AS.

NEWS IN BRIEF

● **NORTHWEST** SEMERC's new catalogue includes a new range of sprites for the BBC A3000 and Archimedes. Arced Sprites contains over 100 curriculum support pictures in Paint format. Themes include air transport, animals, birds, buildings, cartoons, insects, space, and many more. It costs £7.50 plus VAT plus £2.50 p&p. Contact Northwest Semerc on 061-627 2381.

● **THE NATIONAL** Special Needs Software Unit (NSNSU), formed seven years ago as part of the Government's MEP programme, has become a limited company. Based at Resource in Doncaster, the new company is developing major new Scenario Designer programs for the Archimedes for launch this Summer. Contact NSNSU on (0302) 340331.

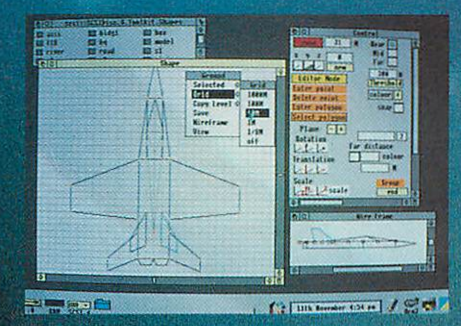
● **THE ACE** Centre in Oxford is launching a Junior Maths Processor program for the BBC Master 128. The program is designed as an enabling tool for users with special needs and is operated very easily from the keyboard or mouse/trackerball. It has three distinct elements – drawing tools, measuring tools and activities which can be used to produce technical drawings or artwork. An Archimedes version is also being planned. The Master 128 version will cost £30. Contact The Ace Centre on (0865) 63508.

● **TWO SPECIAL** needs exhibitions are being planned for later this year. The Special Needs North Exhibition will take place at Haydock Park on May 12 and 13. There will be over 80 displays of educational publishing, equipment and technology, plus a full and varied seminar programme covering both days. Subjects range from teaching and learning styles to trends in special needs software development. Admission to the exhibition is free, although entrance to the seminars is by ticket only, price £5 bookable in advance. A London-based exhibition is also being planned at The Cumberland Hotel on November 4 and 5. For further information, contact Educational Publishers Council Exhibitions on 071-580 6321.

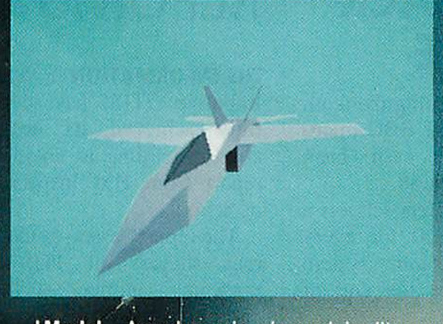
INCLUDES TWO FREE GAMES CREATED USING THE *"FLIGHT SIM TOOLKIT"*

FLIGHT SIM TOOLKIT

The flight sim toolkit contains 5 Risc OS tools which let you create your own flight simulator!



!Shape – Design aircraft, building, runways, roads and rivers.



!Model – Aerodynamic a/c model editor.





!Cockpit – Design instrument panel and displays.

!World – Create your virtual world, set up enemy airfields, defences and supply lines.

Available from: Simis Limited, Headley House, Headley Road, Grayshott, Hants GU26 6TU
Telephone: (0428) 605833



GRAB THAT IMAGE

APART from drawing your own designs, there are basically two ways of getting artwork into the Archimedes – a digitiser or a scanner.

Digitisers can take any video signal as an input and therefore require the use of an additional 'picture grabber' to create pictures. Any camcorder or still video camera (for example the Canon Ion) can be used if it has a suitable output. Video cassette recorders or laser disc players also make ideal picture sources.

HCCS has just released a range of black and white digitisers for Archimedes computers, all priced at around the £50 mark. A low-cost, colour upgrade is promised soon.

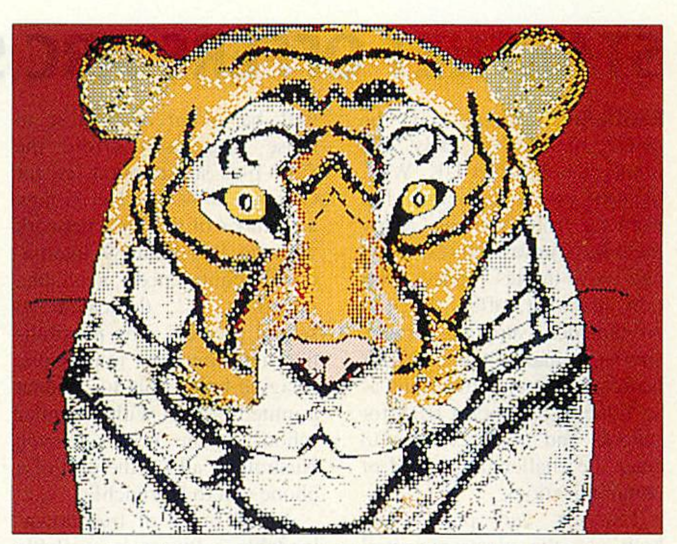
Colour digitisers sell for between £200 and £250. Technomatic, Wild Vision and Pineapple Software all produce such upgrades, all of which perform to a fairly similar standard.

Scanners provide a complete hardware solution to 'grabbing' pictures. Due to their physical design, they are only suitable for copying flat artwork.

A scanner simply works by passing a light (or group of lights) over a picture and recording the intensity (and perhaps colour) of the reflection. Two types of scanner exist – hand-held devices and flat-bed devices.

Hand-held scanners require the whole scanner to be physically moved over the picture. This can lead to slight degradation in the quality of pictures, but a combination of hardware and software refinements can overcome this to a degree. Hand-held scanners cost around £150.

Flatbed scanners are perhaps the best (and most expensive) way of getting pictures into your computer. They work like the hand-held scanners except that the light is guided mechanically over the picture. The extra hardware needed for this, adds a lot to the price and a typical A4-size, flatbed, colour scanner will set you back around £1500.



READER PIC OF THE MONTH



AFTER months of Archimedes pictures, the first few eight-bit BBC masterpieces are starting to trickle through to the graphics column. It's good to see that, ten years on, the Beeb still has its place in the computer graphics world.

This month's pictures were produced by David Hall on a BBC Master using Watford Electronics' *Quest Paint*, my preferred package when I had my original Master. David's work appears on this month's subscribers' disc.

24-BIT COLOUR

THE MAN behind The Serial Port' (now Vertical Twist's) innovative graphics enhancer podule, Peter Arnold, is hard at work on a full 24-bit colour frame store for the Archimedes. This will allow any suitable graphics to be displayed in near photographic realism.The card itself is based around a half-width podule and should be available soon for around £1000.

Due to the way (or more more appropriately, lack of way) that Risc OS 2 and 3 have been written, it is impossible to integrate it directly into the desktop environment, although this won't affect stand-alone programs written specifically for it.

No distributor has been confirmed yet, although Arnold is looking into a few possibilities. Look out for more details on this page soon.

A SNIPPET REWORKED

SNIPPET, the first Risc OS painting package for the Archimedes, has undergone a major reworking. The new *Snippet* retains the ability to 'grab' screens while other programs are running, hence its name, and a number of extensions and improvements to the original have been added, including rotation, shearing and scaling of sprites.

Filling Shapes has been extended to include graded fills between any two colours. Horizontal, vertical and radial fills are also possible. The smoothness of any particular fill can be changed by altering the amount of dithering between intermediate colours.

All shapes for drawing can now be selected from an easier-to-use toolbox, rather than the original text menu. One new tool is a stretchable curve which behaves in a similar manner to Bezier curves found in *Draw*.

An innovative new feature is the backdrop magnifier. Rather than open another window for an enlarged version of your drawing, the new *Snippet* uses the desktop background as the magnifying window.

The new *Snippet* will be available soon. The price is yet to be fixed but there should be the option to upgrade from the original for a nominal fee.

● Meanwhile, *smArt*, a linked graphics system from 4Mation, has a new set of extension kits. *Smartoons* contains a number of figures and animals which can be altered and rearranged. *Look Smart* allows all sorts of animals to be created and *Aliens* contains, well, aliens!

All the new packs are priced at £16 plus VAT. Site licences are also available.

For details, contact 4Mation, 14 Castle Park Road, Barnstaple, Devon EX32 8PA.. Tel: (0271) 25353.

JPEG FORMAT

THE JPEG compressed picture format looks likely become a standard for the Archimedes. DT Software, already well known for its range of high quality colour scanners, is moving further into the graphical section of the Archimedes market with its own JPEG file compression and decompression package.

For those who missed the description a few months ago, JPEG compression works by removing all unwanted information (ie, detail too fine for the human eye) from a picture and replaces it with uniform colour. The resulting file can be up to 90 percent smaller than the original in some cases, thereby taking up less memory storage space.

For further information, contact DT Software, Freepost, Cambridge CB3 7BR Tel: (0223) 841099.

STARTNET OFFERS ARC SUPPORT

REGULAR readers may be aware of StarNet BBs, the home of SchoolNet UK. Well, over the past few months it has been far from dormant. Many areas have now been revamped and new topics added. Not only does it offer the full Archimedes support service, similar to many other ArcBBS boards, but it also functions as an Education Support BBS for schools and colleges keen to enter the challenging world of communications.

Teachers and pupils can both use the electronic mail system free of charge. This will be of great interest to those who can't afford the £200-plus subscription fee for Campus 2000. StarNet is now a member of the Fido network with no less than 39 international conferences available, including 12 dedicated to school projects. The possibilities here are very impressive. Imagine being able to conduct a united project with a similar school in the USA or even Australia – all for the cost of a phone call to Norwich!

A full range of free downloadable software is available for classroom and home use, including all the latest Acorn news releases, hints, tips and product information.

Last December, StarNet joined the international Education Network known as K12. This is composed of 35 communication channels covering art, business education, health, music, languages and science topics, in addition to specialised areas catering for gifted children or those with special learning requirements.

The StarNet BB can be accessed by dialling (0603) 507216 with your comms software set to 8N1.

PLAYING HOST

CHRIS REEVE, who runs the Cyclone BBs in Norwich, is busy helping local programmer Keith Marlow to produce some high quality host software, so that you can run your own BB on an Archimedes.

Archiboard provides strong competition to *ArcBBS* by The Serial Port and is already in use controlling Cyclone.

Cyclone itself caters mainly for PC and Archimedes users and runs on an A3000 armed with 2Mb of memory and a 100Mb hard drive. Supporting all speeds up to v22bis with MNP levels four and five, Cyclone includes 40Mb of downloads, together with television and radio news areas and an online version of Colossal Cave, the original adventure game. Set your comms software to 8N1 and dial (0603) 260973.

Archiboard Host is not quite ready yet but will include multi-line support as standard, 200 conferences, 40 message bases, 2000 users, 10,000 active messages and 10,000 files. These can all be increased if required and the whole system runs within the Risc OS Wimp environment. Questionnaires can be set up and hourly usage rates, together with last 20 user lists, are automatically generated.

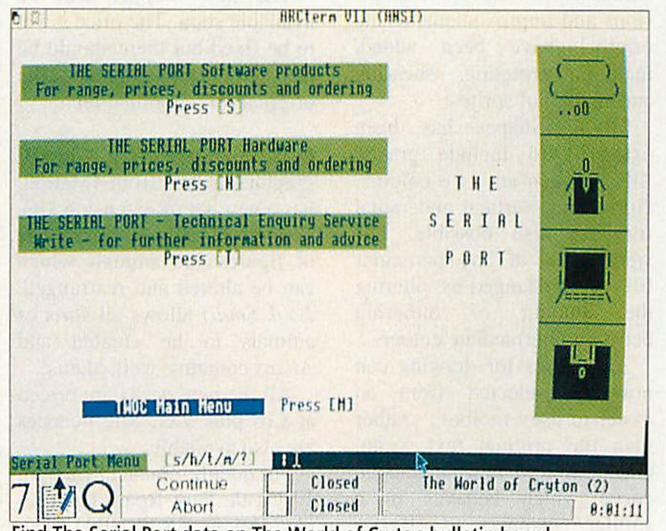
WORLD OF CRYTON

THIS month's star bulletin board is The World of Cryton. The World of Cryton (or TWOC as it is known) has been running for a number of years now and has built up a huge following. It is run by comms guru Hugo Fiennes, who is also responsible for *ArcBBS* and *ArcTerm7*. In fact, he probably owes more to the Archimedes comms scene than anyone else.

World of Cryton runs on *ArcBBS* (not surprisingly) and also gets most new PD (public domain) and Shareware software before any other BB, again due to the fact that most well known names in the Archimedes PD scene log on regularly. It supports the full Fido network, so you can still grab Cryton's messages, even if you don't want to ring the board at long distance rates.

An Acorn Support area is included, as is a full Serial Port catalogue and online ordering service (see below). The Serial Port is Hugo's own company, recently split from QD Enterprises and now a supplier of software and hardware for Archimedes users.

If you haven't rung before, set your comms software to 8N1 and dial (0749) 679794 or (0749) 670030. This is the way to make contact with anyone who is anyone in the Archimedes field.



Find The Serial Port data on The World of Cryton bulletin board

NEWS IN BRIEF

● **EFFECTIVE** from April 1 (no fooling) are some changes and developments in the Prestel network, including the abolishment of all frame charges. This means that there are no additional charges for accessing certain frames. Mailbox charges will also be removed.

While connected, you will only pay the standard time charges and cost of the telephone call itself. There will be no increase in time-based charges. The minor point in the new structuring is that subscription charges will increase from £20 to £25 per quarter. Queries can be answered by calling (0442) 237237.

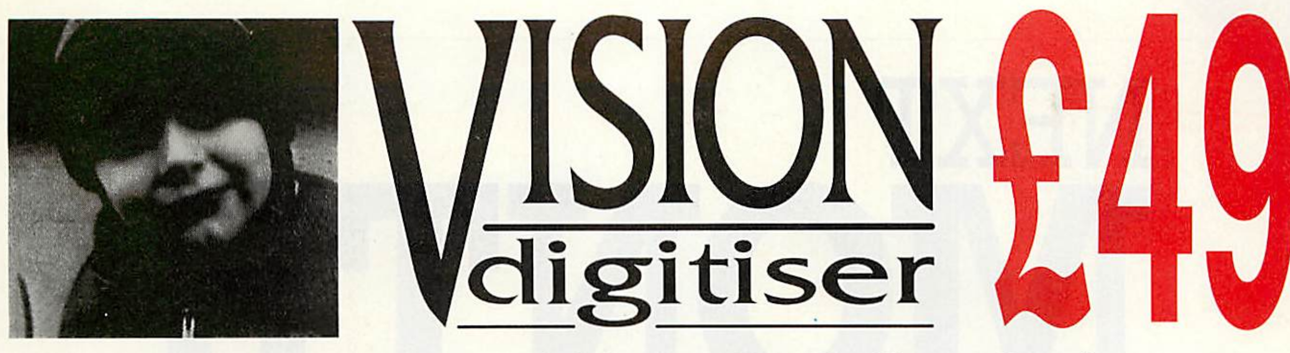
● **THERE** is a new non-electronic threat to BT's directory enquiries for business users. The National Connect freephone directory service has introduced Business Connect, which offers businesses free access to local suppliers at the touch of a button. Using BT's 0800 number technology, the location of a call is instantly recognised and the call is automatically routed to the nearest supplier in the caller's area. The UK has been divided into a number of divisions and membership is restricted to one dealer for each service within a single region. This ensures that high quality is maintained and the user gets the best possible service.

● **A NEW** bulletin board has appeared in Newcastle-on-Tyne. Called Computer Madness and run by Neil Granger, it caters for all computers users and also offers companies the chance to advertise. Radio listeners can examine their own area to find out what channels are out there to listen to. Computer Madness is available on (0661) 71349, but please note that it is currently only online between 6 and 9pm.

● **DO YOU** use the HOBS Bank of Scotland online service? If so, you may be able to help a couple of readers who are having difficulties with it. If you have a contact number, then please write to me.

● **IF YOU** have any news, hints or tips, write to: Paul Vigay, BBC Acorn User, 20-26 Brunswick Place, London N1 6DJ.

Paul Vigay



Some things are so good it's hard to believe they're true

People laughed at Christopher Columbus when he said the world was round. The telephone seemed like an impossibility until Alexander Bell made it reality  in 1876. Nobody would have thought that mould could help cure illness, but Fleming's 1928 discovery of  penicillin revolutionised medicine. Until 1936 people did not believe that they would have images transmitted over radio waves into their own homes, for entertainment, in the form of television.  People found it difficult to believe that a child could be conceived outside the body, but in 1978 Louise Joy Brown was born.



Who would have thought that anybody would be able to produce a high quality video digitiser for only £49? 

HCCS Putting you in the picture with the Vision Digitiser

TECHNICAL SPECIFICATION

- 6 Digitised bits expanded to 8
- Image size of 250×640
- Colour Option available from June
- PAL (1V pk to pk 75 Ohms) input
- ETT (Error Transfer Technique)
- Takes 1 sec. (ARM3 0.5 sec.) approx. to display 'Low Quality' image
- Modes 12, 15, 20 and 21 available
- 256 Grayscales
- Risc_OS Compliant
- On screen Contrast and Brightness controls
- Captures image in real time
- Takes 12 sec. (ARM3 4 sec.) approx. to display 'High Quality' image

HCCS PRODUCTS - AVAILABLE FROM ANY GOOD ACORN DEALER

EXTERNAL SCSI DRIVES

A3000 45Mb 25 mS	£349
A400 45Mb 25mS	£349
A3000 100Mb 25mS	£549
A400 100Mb 25mS	£549
A3000 211Mb 15mS	£999
A400 211Mb 15mS	£999

RAM PRODUCTS

A3000 1Mb RAM	£64
A3000 3Mb RAM	£189
A400 1Mb RAM	£45
A5000 2Mb RAM	£99

HARDCARDS

A3000 HardCard45	£349
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MAKE AN IMPRESSION

The BBC A3000 and Archimedes have emerged as useful desktop publishing platforms, thanks to DTP packages like Computer Concepts' *Impression*. We give you some tips on how to make the most of it

PLUS

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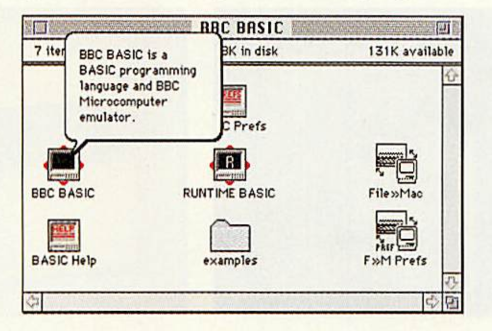
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BBC BASIC Version 3

Programming language and Emulator for the Apple™ Macintosh™

Combines the power of the Macintosh …

BBC BASIC 3 takes advantage of the advanced features of the Macintosh, and System 7, to provide an ideal environment in which to develop, test, and run your BASIC programs.

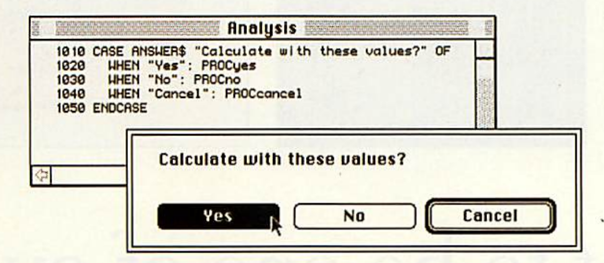


Balloon help provides instant information about the menus and dialogue-box options.

Save Graphics option saves the BBC BASIC graphics screen as a PICT file that can be loaded into other programs.

Runtime BASIC utility converts your BASIC programs into stand-alone double-clickable Macintosh applications.

Macintosh-style interactive editor provides a scrolling view of program listings with convenient cursor or mouse editing. You can work with any font available on your system and you can display keywords highlighted in bold for easy reference.



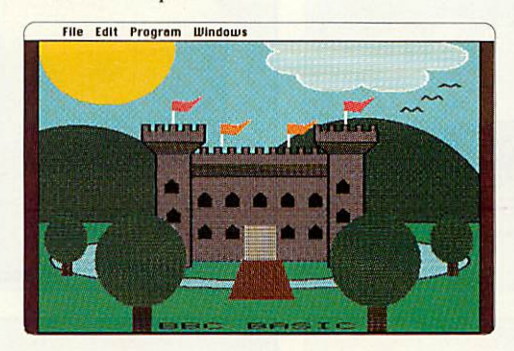
Macintosh Toolbox interface allows you to define your own menus, dialogue boxes, and scrolling lists using convenient BASIC keywords, and use the standard file dialogues for opening and saving data files.

Dynamic tracing and debugging lets you run or step through a program, highlighting each statement as it is executed, and you can display the values of any variables or expressions.

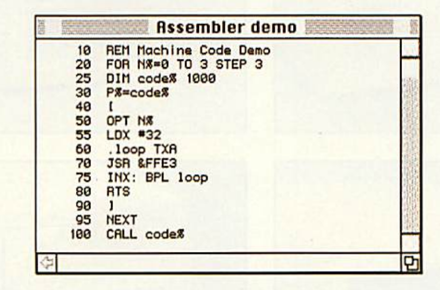
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STAR LETTER £15

I don't expect the computer to solve all of my problems. In fact, being a relative novice, I consider myself fortunate when the machine comes up with some useful interaction and a few pretty pictures. But, what I do object to is some of the symbolism used within the operating system.

Being a peace-loving man, I believe that mutual respect and understanding would be helpful in producing a solution to many of the world's problems.

The basic concept of issuing commands seems arrogant, inappropriate and even farcical considering the frequently uncooperative nature of the recipient of these orders.

If I had been a World War One general, this often recalcitrant A3000 would have been blindfolded and riddled with bullets at sunrise, a thousand times over. Well, I'm not a general of any era, nor would I be, if given a choice in the matter. So I would like to be able to change the word command, and other high-handed terminology used by the system, into sensible alternatives such as 'request' or even 'suggestion'.

Then, perhaps my relationship with information technology may mature to the stage where I can enjoy computing as a grateful recipient of the fruits of the universe, rather than a soggy-footed King Canute of the keyboard.

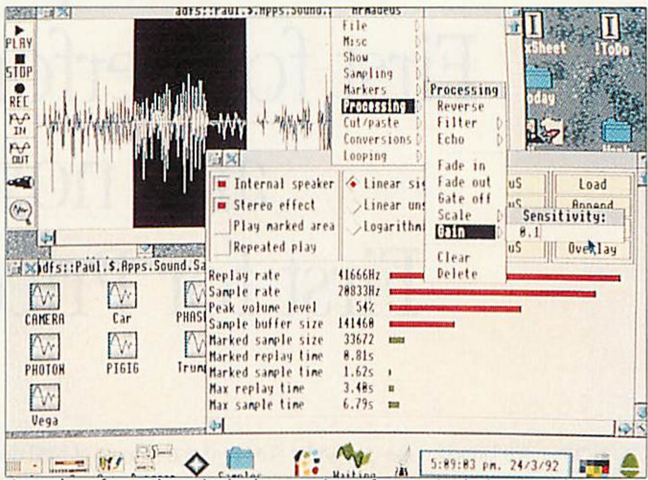
So please let me for one have less of this 'red faced barking of orders as the ship goes down' mentality foisted upon me and be offered an empathetic alternative language, more conducive to co-operation and encouragement, at least for use in the backroom, if nowhere else.

Tony Halmarack
St Helens
Isle of Wight

Believe it or not, Acorn seems to have anticipated this request, because the operating system has the ability to have aliases set for commands.

For instance, try pressing F12 and typing the command (sorry, request) *SET Alias$Cat PleaseShowMeWhatIsOnThisDisc. From now on, until you turn the machine off, typing the polite request PleaseShowMeWhatIsOnThisDisc will indeed do just that. *DESTROY, usually a command of the most serious nature, could be toned down to the less strict, but equally powerful PerhapsYouCouldDeleteTheseFilesButPleaseDoNotFeelGuiltyItIsANecessaryCullingOfData.

No, we don't think so.



Armadeus from Clares is the best package for manipulating samples

SOUNDING OFF

I am engaged in research, analysing the pitches of the human voice, and I'm also an addict of the Archimedes.

What I would like to do is input sound into the BBC A3000 (using Midi perhaps) and then ask the computer to analyse the results. Ideally suited, you might think.

What peripheral equipment and what software would I need? I expect I will have to write my own, but although I have written some hefty Basic programs, I have no idea how to access the Midi interface.

Graham Conridge
Bedford
Middlesex

Actually, the Midi port is only used for controlling compatible Midi instruments, and cannot be used as a sampler. However there are several samplers available for the Arc. The cheapest, at £29.95 plus VAT, comes from Oak Solutions, (0532) 502615, and is called the Oak Recorder. It is simply a microphone which plugs into the parallel port. The microphone is held to a sound source and the sound is recorded into the Arc for editing and playback. For a better quality sample there is the Ecosampler from QD Enterprises (0373) 842200, which plugs into the Econet socket inside the machine. It costs £69 plus VAT.

Armadeus from Clares (0606) 48511, is undoubtedly the best package to use when it comes to recording, playing back and manipulating sound samples.

Watch out next month for the beginning of a new programming series about how to use sampled sound on your Archimedes.

TAKE NOTE

I have been using *Rhapsody* and *ScoreDraw* for some months now and I must say they are very impressive and in my opinion a definite improvement on *Finale* on the Mac or PC.

My main reason for saying this is the vastly improved user friendliness (the manual for *Finale* runs to 1000 pages), speed of input of notes via the clever graphic pointer and the cost: *Finale* is now £700. Even if you add the cost of a full DTP package to *Rhapsody* and *ScoreDraw*, the system is still only £300 or less.

Once all of the promised features are completed in *Rhapsody* – mainly slurs and phrase marks which at present have to be added in *Draw* – and when the sequencer for recording music is completed, Clares will have a music package which is hard to beat on any system, at any price. My only problem with the package, is that at present I do not know of a way of converting *Draw* files of music produced on my system to some form of Mac or PC graphics' file which could be used by a music publisher using *Finale* as their software.

I have seen advertisements for the conversion of colour sprites, but nothing as yet for the *Draw* format. Have I missed out on something?

Nigel Modern
London

Probably the easiest way to get music scores to a music publisher is the same way in which this magazine is produced. Use the Postscript printer driver to print to a postscript file and then place it on to an MS-Dos format disc. Most typesetters are able to input postscript files and run them out as film or bromide. See the article on how we do it (*BAU* August 91) for more information.

PC OR NOT PC?

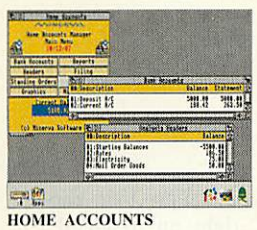
I was interested in John Tebbit's letter (*BAU* February 91). I currently use both PCs and Archimedes at work on a daily basis. John appears to be completely missing the difference between the BBC model B and the far superior Archimedes.

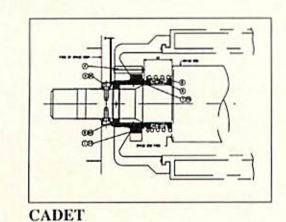
Dos uses memory, whereas Risc OS is held mostly in Rom. To run *Windows*, which after all is only software to imitate the Risc operating system, you use yet more memory, and it is obviously more time consuming – what is the point?

John stated that he wants an A5000, but then proceeded to moan about it. If you cannot afford, it buy an A3000, which is still as good as any PC and perfectly adequate for your children's needs. My only point, and I know this has been said before, is the lack of suitable business software.

Mrs H Roberts
Little Downham
Cambridgeshire

Look out for the feature in next month's *BAU* where we will be comparing the benefits of Arcs, PCs and Macs.

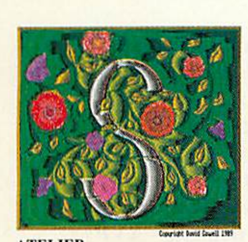

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DESKTOP OFFICE


PRIMEART

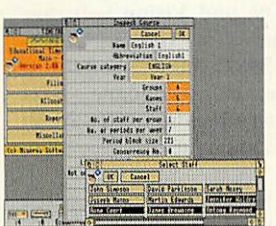


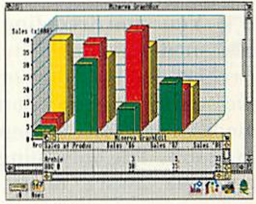

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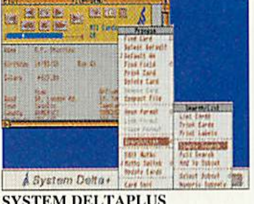

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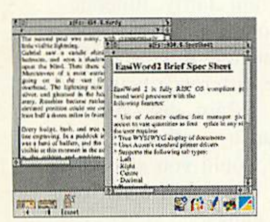

PRIMEART


GRAPHBOX PROFESSIONAL

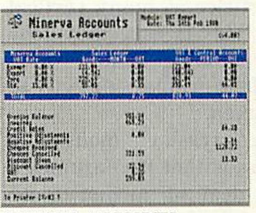

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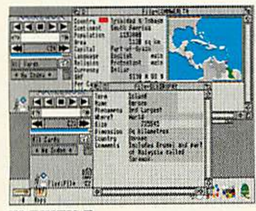

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QUESTIONS AND ANSWERS

Q M. Hetherington of Cumbria has configured his Archimedes and multiscan monitor to power up in multiscan mode 20, which provides a very clear display. However, he has several applications which take over the whole computer and revert back to a non-multiscan picture.

He asks: 'Is there any way I can redefine existing modes to become multiscan ones? Also, why does the screen flicker when accessing the floppy drive in mode 21?'

A You can redefine the modes available on your Archimedes by using one of the many public domain, mode creator programs available. The only thing you must be aware of is that many programs are written for a specific mode, and will not work if they are suddenly given twice as many vertical lines. This is especially true when running games which plot their graphics directly to the screen.

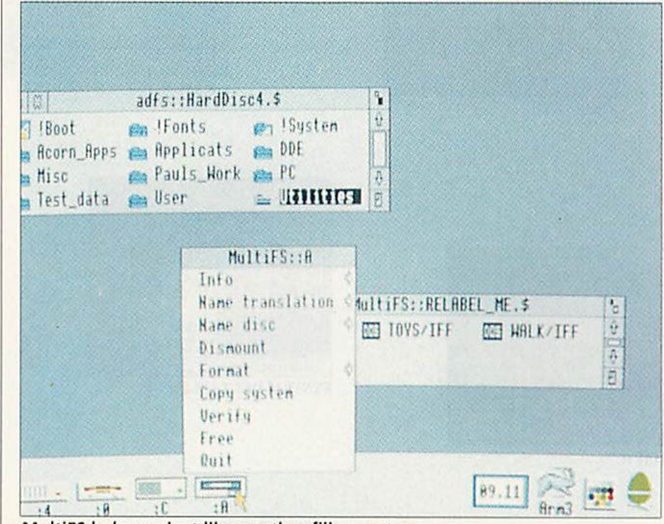
The reason mode 21 flickers is that it consumes a great deal of memory and this requires a certain amount of processor time in order to keep it updated. When the floppy is accessed, the processor cannot keep pace with everything and assumes that the data being read from the floppy is more important than keeping the screen intact, and simply turns the screen off temporarily.

The easiest way around this is to change to a smaller screen mode before doing major disc accesses.

Q F. Treviss of Wembley writes: 'I don't have a hard disc for my BBC A3000, but I would like to transfer Risc OS files to MS-Dos discs using *MultiFS* and a single floppy disc drive. Is there a simple step-by-step procedure for doing this?'

A Yes. First, load MultiFS so that is appears on the icon bar, then catalogue your blank 3.5in disc in the usual fashion by clicking on the drive :0 icon. Next, insert your MS-Dos disc into the drive and click on the *MultiFS* :A icon. You should have two windows on screen; one containing your MS-Dos files and the other a blank ADFS disc. All you now have to do is to select the MS-Dos files you wish to copy and drag them across into the ADFS window.

ADFS and *MultiFS* will both inform you when to swap discs. A quicker way to do this, if you have enough memory, is to create a big enough Ram disc and then copy the MS-Dos files into this, followed by moving them from the Ram disc onto an ADFS disc.



MultiFS behaves just like another filing system

Q Joyce Hull of Dorset is currently writing some software that she wishes to sell commercially, but she wants to use some outline fonts and doesn't want to pay any royalty fees. She asks: 'Other than designing my own fonts, which is very time consuming, is there any source of PD (public domain) fonts that I can distribute with my software?'

A The problem with many fonts is that it is difficult to tell which are PD and which are not. Even with those that are PD, you may find that the original author has stipulated that you may not sell them commercially. Your best bet is to write to some of the PD libraries advertised in *BBC Acorn User*, asking them if they have any of their own fonts that you can use.

If you take the trouble to write to the authors, you may find that some will let you use their fonts in return for an acknowledgement in your finished application.

Q 'I am looking for some educational programs to help my 12 year old son learn French,' writes A Hague of Exeter. 'He is not an absolute beginner, so I would ideally like an application that can help him, right up to GCSE level. Is there any software that you could recommend?'

A There is quite an abundance of language training programs available for the Archimedes, and most of them are listed in the new Acorn Education Directory (issue three) available from most Acorn dealers. AVP Computing of Gwent, (0291) 625439, and Vision Software of the West Midlands, 021-354 3981, both produce a range of secondary level French education software in their catalogues.

Q Roger Davies of Swansea has recently bought a BBC model B computer, fitted with a 5.25in disc drive. He writes: 'I am fairly illiterate when it comes to computers, and I wondered if you could tell me the difference between 3.5in and 5.25in disc drives and if I can use either on my computer? Could you also tell me where I can find a list of disc-based games?'

A Although the obvious difference is the size, the two types of drive are also associated with different formats. The 3.5in discs are generally used with ADFS (Advanced Disc Filing Systems) whereas 5.25in discs are usually DFS format (Disc Filing System).

Although you can format either size on either system, most software houses will supply DFS versions on 5.25in discs and ADFS versions on 3.5in discs. You can find out which disc system is installed in your computer by typing *HELP. Each internal ROM will then be listed, showing ADFS or DFS.

MicroPower of Leeds (0532) 621111 should be able to supply you with a comprehensive list of disc-based software for the BBC B computer.

Q 'I have a BBC model B computer and have noticed that there is quite an loud 'buzz' coming from the speaker,' writes A. Philips of

Wolverhampton. 'I am not an electrician, but can use a soldering iron. Is there any way I can cure this without removing the entire PCB from the computer?'

A **The buzzing noise you refer to is caused by the audio input on the 1Mb bus picking up noise from the computer. One way to get rid of it is to buy a 34-way IDC header socket for the 1Mb bus and solder a 10K ohm resister between pins 1 and 16. When the plug is inserted into the 1Mb bus you should find the problem cured. Or, more ambitiously, if you use the existing peripherals, plugged into the 1Mb bus, you can permanently solder this resistor on to the inside of the plug.**

Q W. Briggs of Co.Down, Northern Ireland has a Canon BJ330 wide carriage printer and wants to print A2-size posters (13.5 x 23.5in). However, when using his current LQ850 printer driver, he finds that it prints the full 13.5in wide but only 11 or 12in in depth unless he switches the printer to fan fold/continuous. 'Is my problem with the printer itself or the driver software at the Archimedes end?' he asks.

A **Many problems of this sort can be traced back to the printer driver software, which has a number of options you can set. I recommend setting your printer dip switch to fan-fold paper so that it does not give automatic form feeds after 11 or 12 in. Then call up the 'page size' menu from the printer driver icon.**

You can define up to four types of paper, each with its own user-defined size. You can toggle between the types of paper via the small 'paper number' icons at the bottom of the window. You can then define an A2-size which should override the automatic form feed.

Q David Forbes has just taken on the running of a large Econet network and wants to find out if network versions of ESM and Muse software can be obtained. He told us: 'I can't seem to find the addresses of the two companies. Do they still exist?'

A **They certainly do. ESM is at Abbeygate House, East Road, Cambridge CB1 1DB. Tel: (0223) 65445. Muse (Micro Users in Education) can be contacted at PO Box 43, Houghton on the Hill, Leics LE7 9GX. Tel: (0533) 433839.**

Q Simon Geoffs of Southampton wants to connect a video recorder and camera to his Arc, hoping to produce some titles and captions for his home videos. He asks: 'Is there any additional hardware or software I need in order to get text from the computer onto video?'

A **You can connect the Archimedes to a video recorder via the video out socket at the back of the machine. However, this will only allow black and white and you cannot overlay the Archimedes picture on to the video recorder picture.**

In order to do this, you need an add on called a Genlock board which plugs into one of the podule spaces in the Archimedes. There are a number of different boards available, depending on the extent of your needs. One company to contact for advice is WildVision which produces a range of video products. Tel: 091-281 8481.

Q At J. Seddon's Merseyside school he has access to a PC armed with a monochrome scanner. He wants to know if it possible to scan some images on the PC and then port the images across to the Archimedes so that he can use them within his desktop publishing program.

A **It is possible. What you need to do on the PC is save the scanned images as GIF files. Using MultiFS (as detailed above) you can then convert GIF pictures to Archimedes format sprites by loading them into a application called *Translator*.**

This is a Shareware program which is available from a number of Shareware libraries and will convert a whole host of foreign graphics formats, including PC Giff and Amiga IFF files into Archimedes sprites, suitable for incorporating into DTP pages.



Translator is designed for importing alien image formats

Q Being a loyal Archimedes owner, James Hasler of Brentwood has tried convincing his father to buy one for his small business.

However, he also needs to run some PC applications under MS-Dos. 'Buying the *PC Emulator* is slightly out of my price range,' writes James, 'but is there a machine I can buy that would run both Archimedes and PC formats together, or at least read the files of both?'

A **The latest version (1.06) of Acorn's PC Emulator will allow you to run PC software under Dos in one window, while still running Archimedes software in another window. Although it is slow in terms of a 386 or 486 PC, it does run the vast majority of popular PC software. There are also a number of utilities available that allow you to read data on PC discs from the Archimedes desktop without the need to load an emulator.**

Arxe Systems, 081-534 1198, produces a PC filer called MultiFS, which is the also supplied with the Acorn PC Emulator and now appears to be the standard PC filer. However, hunting around PD libraries you reveal two or three simple PD versions. **(For more information on PC options turn to page 106.)**

HELP US TO HELP YOU

The Questions and Answers page is your chance to have your problems solved. They can be on any topic – you name it and we'll try to solve it. Please send your questions, whether technical or otherwise, to:

Questions and Answers
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We are happy to answer your queries on these pages, but regret that we are unable to send personal replies to questions sent in. If you send a disc, please put your name and address on the disc itself. It is also useful if you could include full details of your machine. Please enclose an SAE where necessary and mark on your envelope whether you use a BBC eight-bit micro or 32-bit BBC A3000, Archimedes or A5000.

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Print scaled — User height: 100mm
Print user size — Paper overlap: 20mm
Print preset page — Print margin: 20mm
A0 A1 A2 — Print xoffset: 0mm
A3 A4 A5 — Print yoffset: 0mm
Prompt between pages — OK — CANCEL

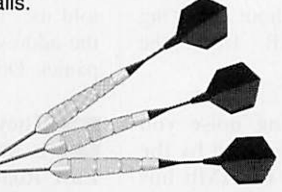
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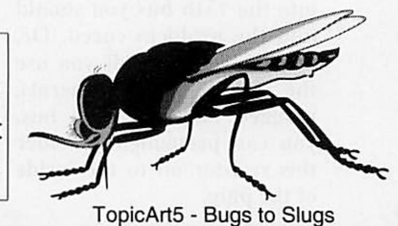

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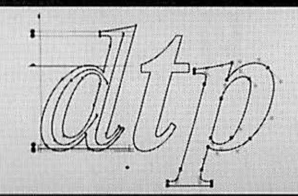
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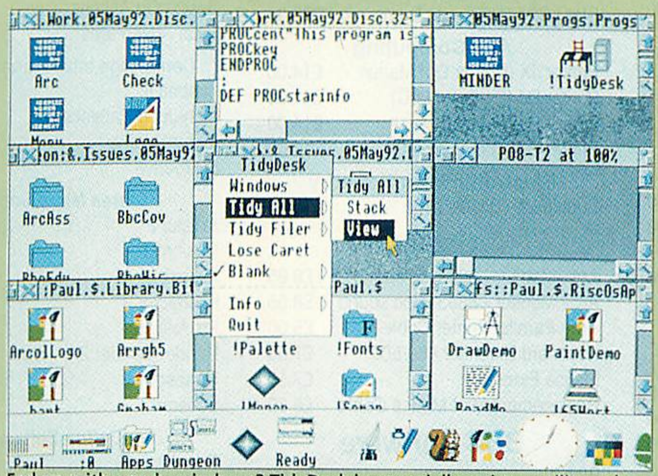
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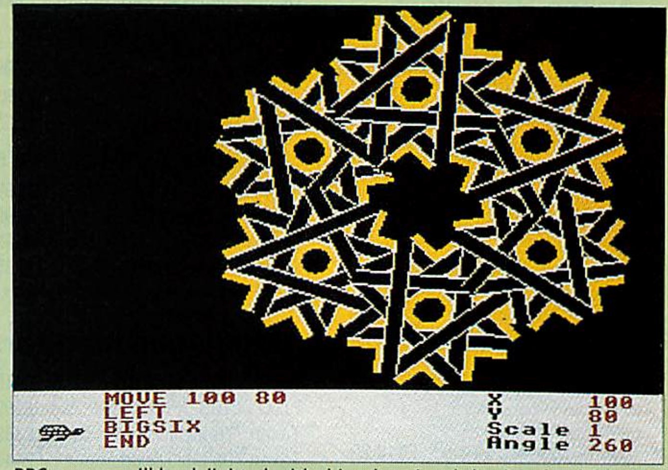


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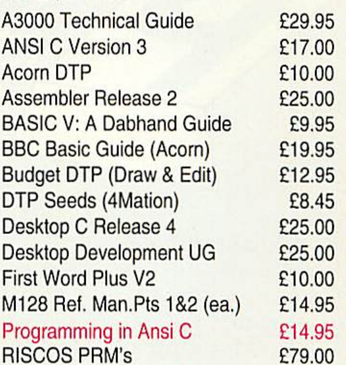
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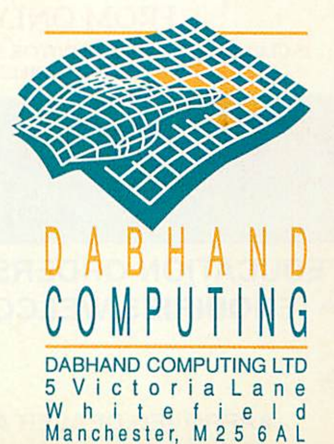


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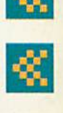


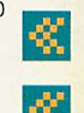
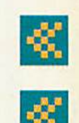
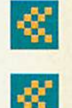
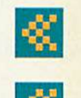
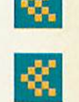
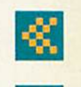
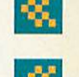
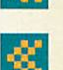
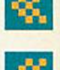
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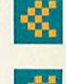









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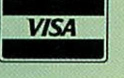
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Graph Box	£59
Graphbox Professional	£107
HotLink Presenter	£40
Kermit	£46
Mogul	£17
Poster	£79
Pro Artisan	£70
Prime Art	£69
Render Bender 2	£95
Snippet	£21
Tween	£21

GAMES

Air Supremacy	£14
Apocalypse	£14
Arcade Soccer	£14
Avante Garde Fonts	£23
Boogie Buggy	£14
Break 147	£18
Bug Hunter	£13
Caverns	£13
Chess 3D	£14
Chocks Away 2	£14
Chocks Away Extra	£14
Chopper Force	£22
Conqueror	£15
Cops	£14
Corruption	£18
Crisis	£21
Elite	£33
Enter the Realms	£19
Enthar Seven	£21
E-Type	£14
E-Type Designer	£13
Family Favourites	£13
Fireball 2	£19
Grievous Bodily Arm	£19
Holed Out Designer	£13
Holed Out Golf	£13
Hostages	£14
Ibix the Viking	£13
Inter Dictor 2	£26
Iron Lord	£15
Jiglet	£25
Jigsaw	£27
Lemmings	£20
Masterbreak	£16
Magpie	£39
Man at Arms	£14
MahJong Patience	£15
Manchester United Europe	£19
Mig 29	£32
Nevryon	£14
Olympics	£14
Pandoras Box	£18
Pipe Mania	£17
Pirate	£16
Power Band	£14
Puncman 1 & 2	£16
Puncman 3 & 4	£16
Pysanki	£14
Quazer	£10
Real McCoy	£22
Real McCoy 2	£23
Redshift	£14
Return to Doom	£16
Revelation	£54
Repton 3	£14
Saloon Cars	£18
Spitfire Fury	£22
Splice	£25
Sporting Triangles	£24
Star Trader	£14
Superior Golf	£14
Super Pool	£19
Swin	£22
Talisman	£12
The Pawn	£19
Timewatch	£24
Trivial Pursuit	£22
Twin World	£15
U.I.M.	£23
White Magic 2	£15
Wimp Game	£13
Worldscape	£16
XFire	£19

Miscellaneous

Ancestry	£59
Arccomm 2	£38
Arcterm 7	£64
Armadeus Sound	£60
BBC DFS Reader	£6
Broadcaster Loader	£65
Compression (CC)	£38
Equasor	£38
FlexiFile	£97
Genesis Plus	£68
Genesis 2	£99
Investigator 2	£22
JX Archi Colour Printer Driver for Citizen & Star Printers	£15
Notate	£52
Numerator	£66
Pin Point	£65
Presenter 2	£29
Presenter Story	£145
Rainforest	£17
Revelation 2	£95
Rhapsody in Blue 2	£45
Show Page	£127
Speech!	£15
SWIV	£19
The Victorian	£17
Time Tabler	£549
Toolkit (Clares)	£35
Touchtype	£40
Tracker	£39
WorldScape	£17

Archimedes Hard Disc

Watford's ST506 Hard disc drives for A310 & A410 series fit internally into the space provided.
P.S. A310 upgrades require a backplane and a fan.

- **3HDP** – Hard Disc Podule only £135
- **3HD20** – 20Meg H' Disc + Podule for 310 £235
- **3HD40** – 40Meg H' Disc + Podule for 310 £345
- **3HD50** – 53Meg H' Disc + Podule for 310 £474
- **4HD20** – 20Meg Hard Disc for 410 £129
- **4HD40** – 40Meg Hard Disc for 410 £215
- **4HD50** – 53Meg Hard Disc for 410 £335
- A3000 20Meg Hard Disc + Podule £299
- A3000 40Meg Hard Disc + Podule £429

For Low Cost, High Performance Archimedes IDE Hard Disc Drives, please turn to page 13

Desk Top Publisher

Acorn's Archi DTP Package	£108
Equasor	£39
Impression 2 DTP Pack	£125
Impression Junior	£69
Impression Business Supplement	£39
Impression II Borders Disc	£19
Expression-PS	£19
Tempest DTP Package	£90

Archi Wordprocessors

Pendown Archi	£48	1st Word Plus – 2	£63
Pendown Outline Fonts	£18	Archie Spell Master	£25
Wordwise + Disc	£24	PD Spellchecker	£40
Image Writer	£25	Graphic Writer	£19
Interword Disc	£24	EasiWord	£18

Databases

AlphaBase	£36	Magpie	£40
Flexifile	£79	Multistore v2.01	£176
Knowledge Organiser	£42		

Spreadsheets

Intersheet Disc	£24	Schema	£89
Viewsheet	£45		

Business Graphics

GammaPlot	£39	Sigmaplot	£39
Interchart Disc	£17		

Integrated Packages

- Logistix £79 • Pipedream 4 £149
- Desktop Office – Database, Graphs & Charts, Wordprocessor Spreadsheet, Communications £98
- Desktop Folio – Wordprocessor, Desktop & Interactive Publishing. Ideal for school environment. £75

A3000 I/O Card (User, Analogue & IIC)

This NEW versatile I/O Card from Watford, fits inside the A3000 and includes an Analog to Digital Converter, a User Port, and an InterIC (IIC) connector.

The card allows many of the peripherals developed for the BBC to be used with the Archimedes A3000. The ADC and User Port have the same pin out and connectors as the BBC computers.

Extensive RISC OS software is supplied to provide BBC OSBYTE calls for support of the ADC and User Ports, including the BASIC keyword ADVAL. The software provides extended RISC OS support for separate interrupts from both the ADC and User Ports, permitting easy interrupt driven operation.

The card is provided with all the software in ROM and is automatically loaded when the machine is turned on.

Peripherals connected to the ports can obtain up to 500mA of power at +5V. A fuse is fitted to the card to protect the A3000 from damage arising from accidental short circuit of the power output.

The card is provided with an extensive manual explaining installation, all software commands, connector pin outs, hardware addresses and example programs.

Features
- An 8 bit User Port with a standard 20 way IDC connector, compatible with the User Port on the BBC computers and the Archimedes I/O Podule.
- A 10 bit Analog to Digital Converter with a standard 15 way D type connector, compatible with the ADC on the BBC range of computers and the Archimedes I/O podule.
- An InterIC (IIC) Port with a 5 pin DIN socket to connect the A3000 to external IIC devices.

£42

Archi Mouse Port Splitter

Our handy little splitter unit eliminates the risk of damaging your micro due to constant plugging and unplugging of the mouse by allowing you to connect both, a joystick and a mouse simultaneously to your Archimedes. £15

Silicon Vision

Gerber Plot	£95	Solids Render	£120
Solid CAD	£120	Solid Tools	£279
Super Plot	£28	Data Vision	£110
Super Dump	£22	Share Holder	£135
Arc PCB Professional			£275
Realtime Solids Modeller			£136

Archimedes to BBC Serial Link Mk 2

Using this simple data link, it is possible to solve all your BBC to Archimedes data transfer problems. The kit is supplied with a disk, and the necessary cable to connect the two computers.
New RISC OS Version **Only £15**

Archimedes External Disc Drive Interface

With this interface it is possible to connect almost any 5.25"/3.5" disc drive with its own power supply to the Archimedes. Upto 4 disc drives can be connected. Fully Buffered Board. NO SOLDERING is involved. Supplied complete with necessary lead.
- A300/A3000 £21 • A400 £25

More Archimedes Products See Pages 3, 5, 6, 8, 10, 13

LANGUAGES (Archimedes)

ISO-PASCAL; FORTRAN 77			£77 each
Assembler; LISP; Prolog X			£149 each
ANSI C Rel. 3	£125	Logotron Logo	£45
Macro Assembler	£40	Risc Basic	£120
Robo Logo	£69	Risc FORTH	£110
BASIC Compiler	£77		



256 Grey-Scale Scanner

Watford proudly introduces its new innovative 256 grey-level hand scanner for the Archimedes range of micros. It offers up to 400 dpi scanning resolution, complete with software.
256 Grey-Scale Scanner is ideal for incorporating pre-drawn logos, artwork, photographs and sketches into desktop publishing documents and other graphics programs. Designed by our own R & D team, it offers the best overall scanning solution for Archimedes micro. Just compare the competition on our price and these outstanding features:

- Full 105mm 400dpi scanning operation in just 3mS per line! (Twice as fast as most scanners.)
- Selectable 256/16 grey levels
- Full scan preview, scale to fit windows
- Complete set of image enhancement tools
- Single width podule
- True brightness and contrast control
- Fast RISC OS printing
- Over 1000 Image processing options; smoothing, enhancement, edge deletion, convolution, etc.
- Full Interface to ChangeFSI

Special Launch Price £185

ULTIMUM – Archimedes A3000 Podule Racking System



THE ONLY LOGICAL WAY TO EXPAND YOUR A3000 COMPUTER

Price: £149

Minerva's Archimedes Software

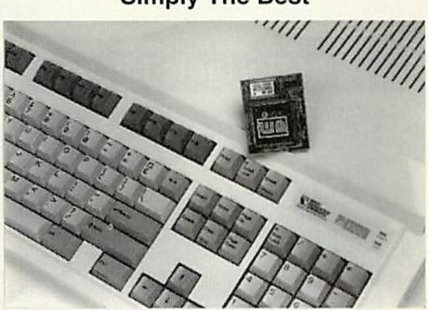
EasyWord	£18	Mailshot*	£27
Home Accounts	£35	Reporter*	£27
Time Tabler	£549	School Admin*	£65
System Delta	£59		

System Delta Program Reference Manual £29
** Requires System Delta to operate*

Stand alone Business Accounts Packages
Sales; Purchase; Order Processing and Invoicing; Nominal; Stock management
£79 per module
or Complete Business Package **£325**

ARM 3 Turbo Card

Simply The Best



Here it is at last – the all new Mark 2 version of Watford's highly acclaimed ARM 3 processor board for the Archimedes and now also the A3000 series computers. Using the latest surface mount technology on a high quality four layer circuit board we have reduced the overall size to a mere 53mm x 45mm, and the cost to only £199. Mk II upgrade will increase the speed of your micro by a factor of 3 to 6.
Any competent A300 or A400/1 series micro owner can fit the upgrade himself, as we provide full fitting instructions and a special ARM chip extraction tool. However for A3000 micros and those not wishing to perform the upgrade themselves, we will collect, upgrade and return your micro by courier service, at an additional cost of £18.
(A300 and old A440 series owners please note – you will need to upgrade to MEMC1A for ARM3 to work.)

RRP £249

Offer Price £169

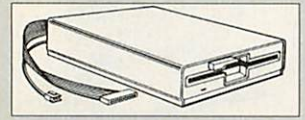
Acorn have satisfactorily evaluated Watford's ARM 3 upgrade and the A3000 upgrades are fitted by Acorn approved surface mount technology centre, therefore its fitment will not invalidate Acorn's warranty on the micro.

Continued→ → → → → → → → → →

BBC MASTER

MASTER 128K Micro incl. Acorn's View, Viewsheet, ADFS, BASIC Editor & TERMINAL plus FREE OFFER (see below) **£399**

FREE OFFER



A 5.25" Double Sided, 40/80 track switchable 400K Disc Drive complete with cables and a Utilities disc incl. 2 games, plus

Gemini's OFFICE MATE & OFFICE MASTER packages on Disc consisting of: Database, Spreadsheet, Beebplot graphics. Accounts packs: Cashbook, Final Accounts, Mailist, Easyledger, Invoice & Statements, Stock Control.

FREE with every BBC Master purchased from us during April

Add-Ons & Accessories

Econet Module for the Master		£42
Twin ROM Cartridge for Master		£9
Quad ROM Cartridge for Master		£14
Master Reference Manual I	(No VAT)	£14
Master Reference Manual II	(No VAT)	£14
Master Advance Ref Manual	(No VAT)	£17
64K Upgrade Kit for B+		£32
Acorn 1772 DFS Kit complete		£49
ECONET Upgrade Kit for BBC B		£42
ALL ECONET UPGRADES Available		
ARIES' IEEE Interface for BBC B & Master		£238
Morley Teletext Adaptor with ATS Rom		£99
Ecolink		£270

Z88 Portable Micro



£179

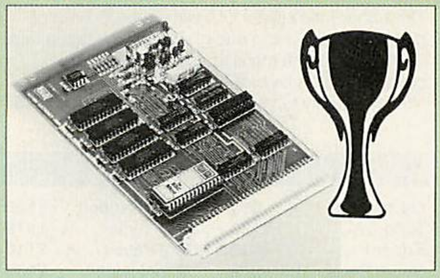
FREE

With every Z88 purchased from us, we are giving away absolutely FREE, a Z88 to BBC Interface Link, 4 rechargeable batteries and a compact Mains Battery Charger worth £38.

Z88 ACCESSORIES

• 32K RAM Pack or 32K EPROM Pack	£16
• 128K RAM Pack or 128K EPROM Pack	£32
• 512K RAM Pack	£86
• 256K Eprom Pack	£55
• Z88 Eprom Eraser Unit	£38
• Z88 Carrying Case	£8
• Z88 Computing Book	£9.95
• AA Nicad Rechargeable Battery	£1.50
• Battery Charger Compact & Fast	£6
• Z88 Serial Printer Cable	£8
• Z88 Parallel Printer Cable	£18
• Z88 to Archi Link	£15
• Z88 to BBC Link £8	
• Z88 to PC Link II £27	
• Z88 to Macintosh £32	
• Z88 Mains Adaptor £9	
• Z BASE	£56
• Z TAPE	£42
• Z TERM	£42
• Z88 Modem	£114

Archi Real-Time Digitiser



Now supplied with NEW RISC OS Version Software

Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air televison signals may also be digitised via a video recorder or TV tuner. Please write for further details.

Price £119

A Set of Colour Filters for colour image grabbing using a video camera £16

Archi Graphic Tablet



The Archi Graphic Tablet offers performance and accuracy comparable to other tablets priced at well over £400, and has the useful addition of a liftable cover, which can hold tracing material or menu templates securely. The package is supplied complete with sophisticated Archi software. (Now, fully LinCAD compatible. Recommended by Linear Graphic for use in Education).
(FREE this month, PC Mouse Drivers & Art package)

Special Price £165

(Price includes Tablet, Leads, Software & Puck)
Stylus Optional Extra **£15**

Archi Graphic Tablet Junior. Working area 9" x 6". Price includes Stylus **£110**

Disc Plonker Rack



When using ones micro, there is a tendency to have more than one Disc on the desk. This exposes them to the hazards of fingerprints, scratches, dust, coffee and an untidy desk. Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. Holds up to eight 5.25" discs.

Protection at Only: £2

Special Bulk Offer Discs

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)

BULK PACK DISCS in lots of 100

Type	S/S 40T	D/S 40T	D/S 80T
• Without Sleeves 5.25"	£28	£33	£38
• With Sleeves 5.25"	£31	£36	£41
• 3.5" D/S D/D	£27 for 50		£49 for 100

Acorn & Watford DFSs

• Watford sophisticated DFS ROM	£16.00
• Watford DFS Kit complete	£69.00
• We will exchange your existing ROM for Watford's ultimate DFS ROM at only	£12.00
• DFS Manual (comprehensive)	£6.95
• Acorn DNFS ROM	£17.00
• Acorn ADFS ROM only	£25.00
• Acorn 1772 DFS ROM Kit	£49.00

(The single Density DFS system is now old technology. Like Acorn, Watford too have replaced it with their more up-to-date 1772 DDFS Interface. We have informed most of the software houses of this decision in order that they can ensure compatibility with our highly sophisticated and fully Acorn compatible DDFS).

Watford's MkII 1772

Single/Double Density DFS

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our Mk II DDFS Board with its 1772 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1772 DFS, plus the added features as follows:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches.
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.

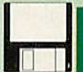
- SPECIAL PRICE **£44.00**
- DDFS Manual (No VAT) **£6.95**
- We will exchange your existing DFS Kit for our sophisticated DDFS for only **£30.00**



3M – Diskettes

3M – SCOTCH Diskettes with Lifetime warranty from Watford Electonics your 3M Appointed Distributor

• *10 x 5.25" S/S D/D 40T (744)*	*£5*
• *10 x 5.25" D/S D/D 40T (745)*	*£5*
• *10 x 5.25" S/S D/D 80 Track (746)*	*£7*
• *10 x 5.25" D/S D/D 80 Track (747)*	*£7*
• *10 x 5.25" 1.6M D/S D/D High Density for IBM XT and AT*	*£9*
• *10 x 3.5" S/S D/D 40/80 Track*	*£7*
• *10 x 3.5" D/S D/D 40/80 Track*	*£7*
• *10 x 3.5" Double Sided High Density*	*£13*



Top Quality 3.5" & 5.25" Diskettes

To complement our range of Quality Discs and Disc Drives. WE are now supplying SPECIAL OFFER packs of 10 Lifetime guaranteed discs. Each disc has a reinforced hub ring. Supplied complete with selfstick labels and a Plastic Library Disc Box.

• *10 x M3 3.5" D/S D/D 80 Track*	*£7*
• *10 x M9 3.5" D/S High Density*	*£12*
• *10 x M4 5.25" S/S D/D 40 Track*	*£5*
• *10 x M5 5.25" D/S D/D 40 Track*	*£5*
• *10 x M7 5.25" D/S D/D 80 Track*	*£7*
• *10 x M8 5.25" D/S H/D Hi-Density*	*£9*
• *M2 3" Double Sided*	*£2.50 each*

Quality Disc Drives from Watford

All our Disc Drives are Double Sided and will operate in both Single and Double Density modes. All 5.25" Disc Drives are 40/80 track switchable. For ease of use, the switches are front mounted. Various UK "manufacturers" of disc drives for the BBC Micro (more accurately, "packagers" label other manufacturers drives with their own name). We buy the high quality NEC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public.

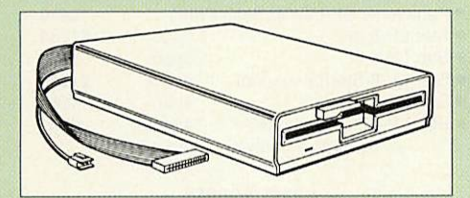
If you look around the popular BBC Micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.

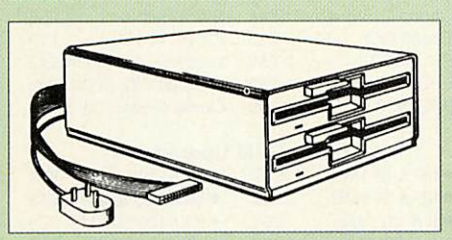
Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. ***Ideal for Schools & Colleges.***

When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space. Your BBC Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double Plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with a Watford plinth. (Turn to the 6th page of our advert for the Plinths).

P.S. All our 5.25" Disc Drives with PSU are compatible with the Compact Micro. All you require is our special Compact Disc Drive cables designed by us.

"Test Bureau Approved for Use in Education"





Our Disc Drives conform to BS415

Type	Description	
	Disc Drive without PSU	
• **CLS400S:**	Single, 40/80 track 400K Double sided Drive	£70
• **CLD800S:**	Twin, 40/80 track, 800K Double sided Drives	£138
	Disc Drive with PSU	
• **CS400S:**	Single, 40/80 track, 400K Double sided Drive	£80
• **CD800S:**	Twin, 40/80 track, 800K Double sided Drives	£153

Special Cable to connect both 3.5" and 5.25" Disc Drives simultaneously to the BBC Compact £13

3.5" Disc Drive

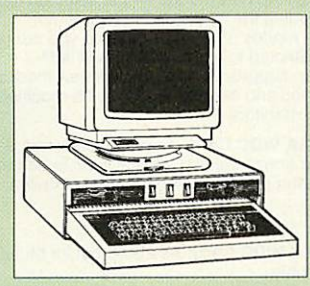


These top quality 3.5" Double sided, 80 track, are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc.

Type	Description	
	Disc Drive without PSU	
• **CLS35:**	Single Disc Drive, 400K	£59
• **CLD35:**	Twin Disc Drives, 800K	£109
	Disc Drive with PSU	
• **CS35:**	Single Disc Drive, 400K	£82
• **CD35:**	Twin Disc Drives, 800K	£126

(P.S. CS35 is supplied in a twin case with a blanking plate to enable easy expansion to a dual drive at a later stage)

Disc Drives in Monitor Stand



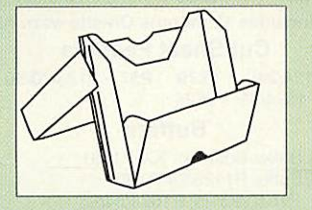
• **CDPM 800S** – Twin 5.25", 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC B & Master 128K micros. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use.

£165

• **DP35 800** – Same as above except, one disc drive is a 5.25" and the other is 3.5".

£154

Plastic Library Cases



DLC1 –	Holds 5 x 3.5" Discs.	£1.50
DLC2 –	Holds 10 x 3.5" Discs.	£1.90
DLC3 –	Holds 5 x 5.25" Discs.	£1.60
DLC4 –	Holds 10 x 5.25" Discs.	£2.00

Disc Albums

Attractively finished in leather-look PVC Vinyl

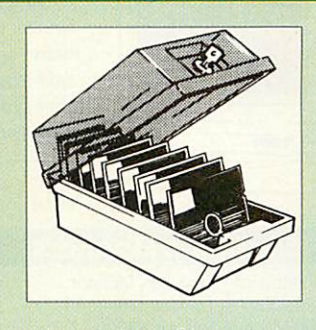
DW1 –	Holds 6 x 3.5" Discs	£2.50
DW2 –	Holds 6 x 5.25" Discs	£3.00
DW3 –	Holds 20 x 5.25" Discs	£3.50
DW4 –	Holds 40 x 3.5" Discs or 5.25" Discs	£4.50

Floppy Head Cleaner Kit

The heads in floppy drives are precision made and very sensitive to dirt. The use of Cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. it is very simple to use. Available in 3.5" & 5.25", please specify.

Price £4

Antistatic Lockable Disc Storage Units



Gives double protection – Strong plastic case that affords real protection to your discs.
Antistatic helps avoid data corruption whilst in storage. The smoked top locks down.
Dividers and adhesive title strips are supplied for efficient filing of discs.

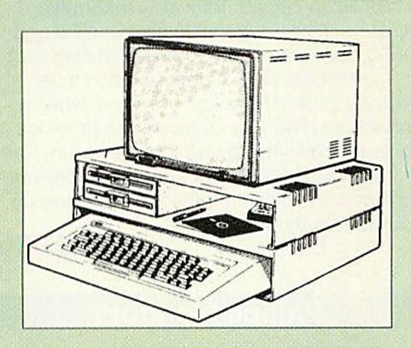
• **M35**	– holds up to 50 5.25" discs	£4.95
• **M85**	– holds up to 95 5.25" discs	£6.95
• **M25***	– holds up to 25 3.5" discs	£4.95
• **M50**	– holds 50 3.5" discs	£6.50
• **M100**	– holds 100 3.5" discs	£6.99
• **M10**	– holds 8 of No. 10 Data Cartridges	£15

* Not lockable

Dust Covers (For our Disc Drives)

Single CLS (without PSU)	£3.20
Single CS (with PSU)	£3.25
Twin CLD (without PSU)	£3.85
Twin CD (with PSU)	£3.90

Plinths for the BBC B, BBC Master & A3000



Protect your computer from the heat of your VDU. Our micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and VDU, whilst the double height version provides enough room for our stacked disc drive and other peripherals like, Eprom programmer, music unit or simply discs & stationery. The computer slides neatly in the lower section allowing easy access to remove the lid. Colour: Matching BBC Beige.

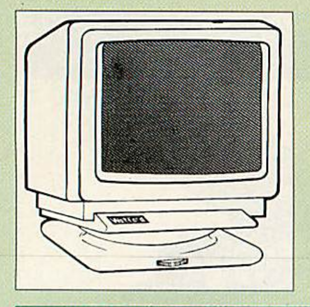
Single BBC Plinth	420 x 310 x 105mm	£13
Double BBC Plinth	420 x 310 x 210mm	£24
Single Master Plinth	490 x 310 x 105mm	£14
Double Master Plinth	490 x 310 x 210mm	£26

A3000 Single Plinth (very sturdy & precision made), has a slot on the left for the switch & cut out on the right for 3.5" Disc Drive £13



CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 250234 or 233383

Continued→ → → → → → → → → →



FREE Monitor lead. Please specify type required when ordering your monitor.

Microvitec Monitors

• **1431** – Standard Resolution Monitor	£169
• **1451** – Medium Resolution Monitor	£209
• **Cub3000** Medium Res for A3000	£189
• **1441** – High Resolution Monitor	£359
• Dust Cover for Microvitecs	£5.50
• **Touchtec 501 Touch Screen**	£239

Now 3 years Parts & Labour warranty on all Microvitec Monitors

Multiscan Colour

• Eizo 9060S	£389	• NEC 6FG	£1525
• Eizo 9070S	£579	• Taxan 770LR	£362
• NEC 3FG	£370	• Taxan 775	£362
• NEC 4FG	£465	• Taxan 795	£397
• NEC 5FG	£850	• Taxan 875	£685
• VIDC Enhancer Board			£25

(We will supply the Watford's superior Multiscan VIDC Enhancer for Archimedes micro at only £10, if purchased with any Eizo or Taxan monitor.)
(P.S. Taxan 795 monitor is supplied with a FREE VIDC enhancer board)

Aries AlphaScan Monitor

Pound for Pound, the AlphaScan VGA Multiscan monitor provides the maximum performance and greatest flexlbility of any 14" colour monitor for the Archimedes micro.

Its multiscan circuitry provides automatic adjustment for frequencies between 30 and 60KHz horizontal, and 50 and 90Hz vertical. Its 0.28mm dot pitch high resolution tube provides super sharp text graphics, while a high speed (70/72Hz) refresh rate provides a flicker-free display easing the eye strain. The Multivideo VIDC Adaptor supplied (free) with the monitor allows high resolution operation in all screen modes.

£325

Philips Monitors

• **BM7502** 12" Hi-res Green Monitor	£67
• **CM8833** 14" Med. Res Colour Monitor	£167
• Dust Cover for Philips Monitors	£6

STAR BUY

• **PHILIPS 14"** Medium Res, dark glass, attractively finished Colour Monitor. A push-button switch toggles between Hi-Res monochrome green text mode and full colour display. (Please state the type of Connecting Lead you require).

ONLY £166

Spare Monitor Leads

BNC Lead for Zenith or Philips	£3
Skart Monitor Lead	£5
RGB lead for TAXAN Monitors	£3
Archimedes Colour Monitor Lead	£7.50

Concept Keyboards

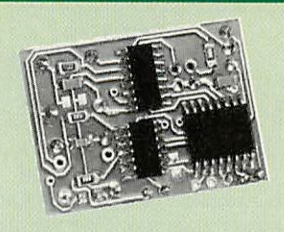
Standard A3 Keyboard with BBC Software	£138
Standard A4 Keyboard with BBC Software	£109
Archi A3 Keyboard	£139
Archi A4 Keyboard	£110

Aries 2000 Colour Monitor

This attractively finished, etched screen medium res monitor is supplied complete with built-in speaker, volume control and video output. All controls are located on the front panel for ease of use. Ideal for BBC, BBC Master, Archimedes and Amiga.

A bargain at £159

VIDC Enhancer



This unique VIDC add-on board for the Archimedes, caters for all types of Multiscan and VGA monitor and mode requirements. There are 2 versions to suit all requirements. The multimode software supplied, provides all the new modes for the selected monitor type, including the now standard Computer Concepts modes. With VGA monitor, you are no longer restricted to a few modes. A WIMP application supplied on disc, allows new modes to be designed and existing modes to be modified for particular monitors.

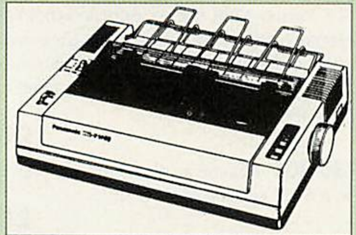
Super VGA VIDC Card: A unique electronic design allows the horizontal and vertical sync to be buffered and have the polarity changed under software control

£45

MultiVideo VIDC Card: As above but for MultiScan monitors only.

£25

Panasonic Printers



• KX-P1123	£129	• KX-P1695	£272
• KX-P1124i	£173	• KX-P2624	*£295
• KX-P1170	£100	• KX-P2180	£165
• KX-P1624	£272	• KX-P2123	£219
• KX-P1654	*£335		

*** Price includes 12 months On-site warranty**

Cut Sheet Feeders

P36 – 1124/24i £79 **P37** – 1123/70/80 £69
P38 – P1624/95; P2624 £129

Buffers

P12 4K Buffer Board for KX-P1081 £55
P14 32K Buffer P1123/24/70/80 P1540/92/95; P1624/54/95 £16

Serial Interfaces

P19 for P1123/24/24i/70/80/1624/54/95/2624 £49

Citizen Printers

• 120D Plus	£100	• Swift 9	£134
• 124D	£145	• Swift 24E#	£234
• 224	£185	• Swift 24X	£299
• PN-48	£209	• PN48 Ribbon	£4

FREE Colour Option with Swift 24E

• Swift 9 Colour Option	£19
• Swift 24 Colour Option	£29
• Swift 24 Ribbons Black £4	Colour £13
• Citizen/Archimedes Colour Printer Driver	£15

Integrex Colour Jet

• Colour Jet 132 Printer	£449
• Paper Roll	£6.50
• BBC Screen Dump Software	£10
• Colour Cartridge	£21
• Black Cartridge	£12.40
• 100 A4 OHP transparencies	£55
• 8K Serial Interface Optional	£123
• Colour Jet 2000	£POA

Star Printers

• LC15	£173	• LC200 Colour	£143
• LC20	£100	• SJ48 Inkjet	£174
• LC24-10	£133	• XB24-200 Colour	£295
• LC24-15	£240	• XB24-250 Colour	£355
• LC24-20	£169	• XB24 Colour kit	£29
• LC24-200	£164	• ZA200 Colour	£234
• LC24-200 Colour	£203	• ZA250	£297
• Star/Archimedes Colour Printer Driver			£15

Star Accessories

Cut Sheet Feeder

LC10/200/24-10	£65	LC15/LC24-15	£125
XB24-10	£80	XB24-15	£139

Serial Interfaces

8K Ser LC-200; LC24-200; FR10; FR15; XB24-10; XB24-15 £52

Buffers

32K Ram Card for LC/XB24-10; 15; LC200 £55

Ribbons

LC10; LC10-II; LC15	Black £4;	Colour £6
LC-200; LC24-200	Black £5;	Colour £12
XB24-10; XB24-15	Black £5;	Colour £12

Laser Printers

All Laser Printers include 12 months On-site maintenance

• Brother HL-4	4ppm	£594
• Brother HL4-V	4ppm	£694
• Brother HL4-PS Postscript	4ppm	£1079
• Brother HL8-V	8ppm	£1044
• Canon LBP-4+	4ppm	£575
• Canon LBP-8 III	8ppm	£970
• Canon LBP-8III Plus	8ppm	£965
• Epson EPL4100	6ppm	£550
• Epson EPL7500	6ppm	£1150
• Epson EPL8100	10ppm	£965
• HP Laserjet IIP+	4ppm	£625
• HP Laserjet III	8ppm	£1015
• HP Laserjet IIID	8ppm	£1499
• HP Laserjet IIIP	4ppm	£705
• HP Laserjet IIIsi	16ppm	£2525
• Panasonic KX-P4420	8ppm*	£620
• Panasonic KX-P4450i*	11ppm*	£925
• Panasonic KX-4455 Postscript	11ppm*	£1450
• Panasonic KX-P4430 Satin Print*		£999
• Star LP-8 III 2	8ppm	£1249
• Star LP-8 III	8ppm	£910
• Star LP-8 Star(post)script	8ppm	£1140
• Star LP-4	4ppm	£565
• Star LP-4PS Postscript	4ppm	£779

* Now with 2 years On-site warranty

Laser Toners

Canon 2, 3 & 4	£46	Star LP-8	£56
Epson GQ	£13	KX-P4420/50	£19
EPL 4100	£59	Laserjet HP IIP & IIIP	£42
EPL7100	£82	Laserjet II/D, III/D	£48
EPL7500	£99	Qume Crystal (3)	£58

Laser RAM Upgrades

• IIP & III 1MB	£51	• EPL7100 256K	£39
• IIP & III 2MB	£88	• GQ5000 512K	£42
• II & IID 1MB	£64	• KX4420/50 1M	£75
• II & IID 2MB	£99	• KX4420/50 2M	£115
• II & IID 4MB	£146	• KX4420/50 4M	£195
• Canon LBP4 1M	£105	• Star LP8 1M	£139
• Canon LBP8 2M	£125	• Star LP8 2M	£275

Laser Drum & Developer

• Epson Drum GQ5000	£93	EPL7100	£129
• Panasonic 4420 Drum	£60	Developer	£59
• Panasonic 4450 Drum	£93	Developer	£80
• Qume Drum	£76	Developer	£56

Jetpage Postscript Cartridge

• HP IIP/III £225 IID & IIID £227

Various Add-Ons

• Laserjet Appletalk Interface	£135
• HP Adobe Postscript	£399
• Pacific Page Postscript	£259
• HP Premier Font Collection	£28
• Laserjet various Font cartridges	from £45

Hewlett-Packard Printers

• # Desk Jet 500	£285	• Paintjet XL	£1045
• Desk Jet 500 Col.	£449	• Quiet Jet Plus	£384
• Paint Jet Colour	£430	• HP Think Jet	£265

3 years extended Parts & Labour warranty £49

- DeskJet 500 Cart. Black **£15;** Colour **£27**
- Paintjet Cartridges Black **£19;** Colour **£23**
- Desk Jet 500 256K RAM cartridge **£99**
- HP Epson FX Emulation Cartridge for Desk Jet **£59**
- DJ 500 High Capacity Black Cartridge **£21**

Plug In Font Cartridges for DJ 500

- 22706B – Prestige, Elite, Line Draw fonts **£55**
- 22706C Letter Gothic & HP Line Draw fonts **£56**
- 22707P – Proprint Emulation Cartridge **£57**
- Desk Jet Unlimited (Book No VAT) **£19.75**

Canon Bubblejet Printers

	Printer	CSF	D'ble Bin	Ink Cart
BJ10EX	£183	£43		£16
BJ300	£289	£88	£65	£12
BJ330	£380	£110	£79	£12
BJC800C	£1419			

- Spare Battery pack for BJ10E **£33**

NEC Pinwriter Printers

• P20	£180	• P70	£419
• P30	£240	• P90	£635
• P60	£325		

- P60/70 Colour Option Kit **£59**
- Ribbons Black for P20/30 **£6** for P60/70/90 **£7**
- Ribbons for P60/70/90 Black **£9** Colour **£13.50**

Cut Sheet Feeders

P20 **£59;** P30 **£85;** P60 **£89;** P70/90 **£80**

Epson Printers

DFX5000	£1079	LQ1060 Colour	£595
DFX8000	£1960	LQ1070	£313
FX850	£264	LQ1170	£435
FX1050	£336	LQ2550+	£675
LQ100	£159	LX400	£101
LQ200	£162	LX850+	£140
LQ450	£165	LX1050	£206
LQ570	£205	SQ850	£432
LQ860 Colour	£444	SQ2550	£625
LQ870	£362		

Cut Sheet Feeders for

LQ570, LQ870 **£47**
LX400/850/LQ200/400/450/500/550
LQ1010/1070/1170 **£72**
LX1050 **£115** FX850/LQ860 **£128**
FX1050/LQ1060/SQ850 **£155**
LQ2550 **£299** SQ2550 **£210**

Tractor Feed for

LQ800 **£44;** LQ850/FX850 **£69;** LQ1050/FX1050 **£85;** LQ2500 **£90;** LQ2550 **£90.**

Accessories

- EX800/1000 Colour Option **£45**
- EX800/1000 Colour Ribbon **£14**
- LQ2500 Colour Option **£65**
- Multifont Card for LQ550/850/1050 **£95**

Epson Printer Interfaces

RS232 **£28** RS232 + 2K Buffer **£52**

Printer Leads

BBC Centronics 4' long	£5
BBC Centronics 6' extra long	£7
Compact's Special Centronics Lead	£7
Nimbus Centronics Lead	£6
IBM/Archimedes Parallel Lead 6'	£4
IBM/Archimedes Parallel Lead 5 metres	£10
IBM/Archimedes Parallel Lead 10 metres	£15
Double Ended 36 way Centronics Lead 4'	£7
Double Ended 36 way Centronics Lead 6'	£9
MSX Centronics Parallel Lead 4'	£12
RS232 Leads (Various)	P.O.A.
IBM Keyboard extension lead coiled	£5

Plotters

• HP7440AU	£525	• HP7475AU	£715

Roland Plotters

• DXY1100	£490	• DXY1200	£620
• DXY1300	£825	• DXY2500	£2345
• DXY3500	£2955	• Sketchmate	£310

- Roland plotter Pens, Fibre tip **£7.50**

Listing Paper (Perforated)

- 1,000 Sheets 9.5" x 11" Fanfold Paper **£7**
- 2,000 Sheets 9.5" x 11" Fanfold Paper **£11**
- 1,000 Sheets 9.5" x 11" NCR 2 Part Fanfold **£21**
- 1,000 Sheets 15" x 11" Fanfold Paper **£9**
- 2,000 Sheets 15" x 11" Fanfold Paper **£16**
- 1,000 Sheets true A4 Fanfold Paper 70gms **£11**
- 2,000 Sheets true A4 Fanfold Paper 70gms **£21**
- Teleprinter Roll (Econo paper) **£4**

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50, 2K Sheets £3.00

Printer Labels

(On continuous fanfold backing sheet)

1,000 90 x 36mm (Single Row)	£6.00
1,000 90 x 36mm (Twin Row)	£6.25
1,000 90 x 49mm (Twin Row)	£7.50
1,000 102 x 36mm (Twin Row)	£6.75

Laser Printer Labels on A4 Sheets

3750 70 x 29mm (3 Rows)	£13.50
3000 70 x 37mm (3 Rows)	£13.25
2625 70 x 42mm (3 Rows)	£13.00

Printer Ribbons & Various Dust Covers

Type	Ribbons	Dust Covers
BBC Micro	–	£3.50
BBC Master	–	£4.00
Archimedes Micro pair	–	£9.00
Citizen 120D	£2.75	£4.50
DMP2000	£2.75	£4.75
DMP4000	£3.75	£4.85
EX800/1000	£3.50	£5.00
RX/FX80/85/800/MX80	£2.95	–
FX/MX/RX100/1000	£3.95	–
Kaga/Taxan KP810/815	£3.25	£5.00
LQ400/500/550/800/850	£3.25	£6.00
LQ1050/LQ2500	£4.00	–
LX80/86/800/850	£2.75	£4.50
LX400	£3.50	£5.00
M1009/GLP	£2.95	£3.75
NEC P2200	£4.50	£5.00
Panasonic KX1080/81	£3.25	£4.75
Panasonic KX-P1124	£7.00	£5.00
Star LC24-10	£2.95	£6.00
Olivetti Ink Jet Cartridges (set of 4)	£6	

Original Panasonic Ribbons

Guaranteed to last 3 million characters

P110 for KX-P1081, 1592 & 1595 **£6**
P115 for KX-P1180 **£7** **P145** for KX-P1124 **£7**
P140 for KX-P1540 **£8** **P155** for KX-P1624 **£8**

Colour Ribbons for KX-P1081, 1592 & 1595
Brown, Blue or Red **£9 each**

Professional Printer Stand



The professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Its ergonomic design ensures smooth paper flow and automatic refolding.

80 Column version £24 (carr. £3)
132 Column version £29(carr. £4)

Universal Printer Sharers/Changer

Connect up to 5 Micros to 1 printer or 5 printers to 1 Micro with our combined, Sharer/Changer switch boxes.

Standard Low Cost Type

Connects	Serial	Parallel
• 2 to 1	£10	£11
• 3 to 1	£13	£14
• 4 to 1	£16	£17

Professional Type

Connects	Serial	Parallel
• 2 to 1	£17	£18
• 3 to 1	£22	£25
• 5 to 1	£34	£38

Cables extra at £6 each

2 Way Compact Printer Switch

A handy 2 way printer switch can be attached to the micro or monitor for ease of use.

- Centronics **£18;** • Serial **£17**

(Cables extra at £6 each)

Auto Printer Sharer Switch

Connects	Serial	Parallel
2 to 1	£40	£45
4 to 1	£62	£49
8 to 1	–	£89

256k Multi Spooler

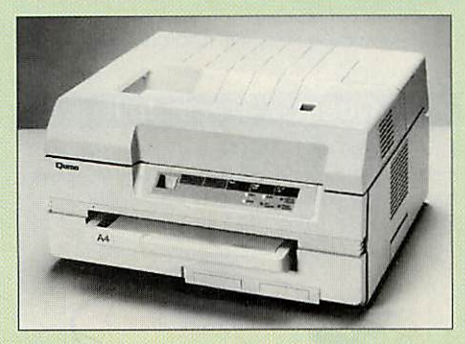
These Auto Parallel Printer Sharers have built-in 256K of Printer Buffers. They can be used as Auto Sharers, Printer Buffers or both.

• 2 In/2 out	£135	• 4 In/2 out	£169
• 8 In/1 out	£199		

Compact Converter Units

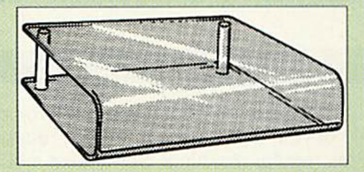
Serial to Parallel **£36** Parallel to Serial **£37**

Laser Direct



- Laser Direct Qume 6ppm complete **£749**
- Special High Res Card 600 DPI for Canon LPB 4 & LPB 8 Laser Printers **£315**
- LPB 4 Printer plus High Res Card **£875**
- LPB 8III Printer plus High Res Card **£1275**

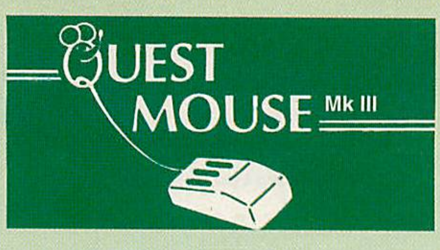
Perspex Printer Stand



Give your Computer System a touch of Class with our elegant, smoke finished Perspex Printer stand.

80 Column version	**£16** (carr £3)
136 Column version	**£20** (carr £4)

Continued→ → → → → → → → → →



- Quest Mouse III & Quest Paint £59
- Quest Mouse III, Quest Paint, AMX Stop Press & Pagefont £89
- Quest Mouse III only £30
- Quest Paint Software only £34
- Quest Font Disc (22 Text Fonts) £15
- Quest Mouse Mat (Red or Blue or Green please specify) £3
- Quest Colour Dump Disc – This new software allows you to print direct from Quest Paint to your Integrex Colour Printer £18

(P.S. Quest Paint is not compatible with BBC Compact)

Quest Paint is the winner of the BBC Acorn User 1990 Award for the Best Art/Graphics software

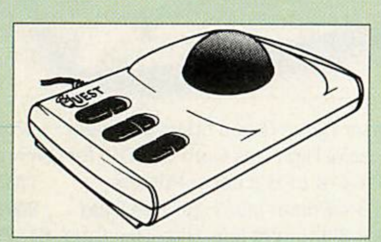


Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.

ConQuest ROM Package £30
(Price includes software in ROM and a comprehensive Manual).
(Not Compatible with BBC Compact)

Quest – Tracer ball

An attractively finished, extremely reliable, mouse replacement, input device. Requires very little desk space. Connects directly to your BBC B, BBC Master or Archimedes Micro.



QT-10 BBC/Master Version **£25**
QT-20 Archimedes Version **£26**

Mouse Cleaning Kit

To obtain trouble free operation and prolong the life of your mouse, the high tech rodent requires regular cleaning. Our deluxe mouse cleaning kit is ideal for the purpose £3

Mk II Light Pen

Ideal for BBC B and Master. Price includes software on disc and operating manual £17

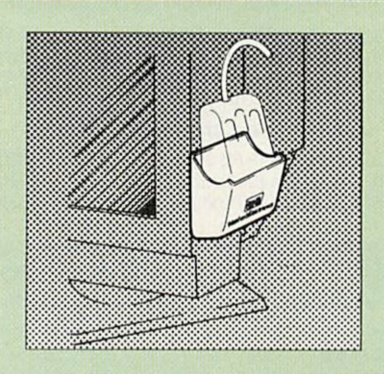
Mk III AMX MOUSE

- **AMX Mouse plus Super Art £54**

(Please specify for BBC, Master or Compact)

- AMX MOUSE ONLY £29
- AMX SUPERART Package £29
- AMX STOP PRESS – A Desktop publishing software. Works with Keyboard, Joystick or a mouse £25
- PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker £13
- AMX DESIGN (ROM) £34
- AMX XAM Educational £15
- AMX EXTRA EXTRA £16
- MOUSE MAT £3

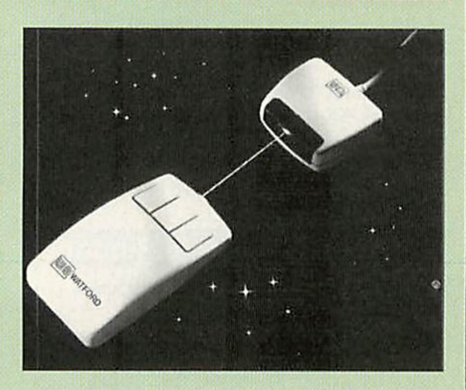
WE Mouse House



Treat your mouse to a cosy Mouse House. This handy little gadget solves the problem of where to store your mouse when it is having a rest. Made of sturdy plastic, the WE Mouse House attaches to the side of your computer, monitor, disc drive etc.

Only £3

Archi Cordless Mouse

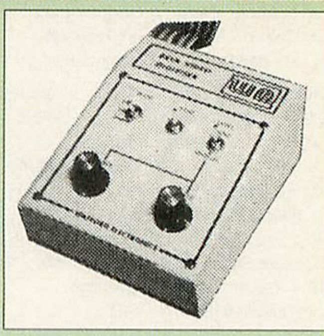


Features

- Infra Red Signal Transmission
- High Resolution 200 DPI
- High Tracking Speed of 600mm/s up
- Anti-static Silicon Rubber Coated Ball
- Low Friction Teflon Footpads
- Power - by two AAA size batteries (not included)
- Automatic Standby Mode after 5 seconds inactive
- Auto Power Shut-Down after 20 seconds inactive

Price £59

BEEB VIDEO DIGITISER



"Test Bureau Approved for Use in Education"

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro. This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket. The software supplied includes a sophisticated, fast screen dump routine.
Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem. The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.

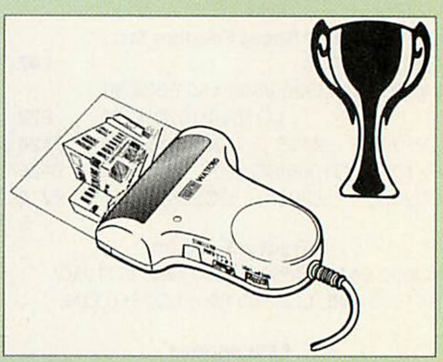
£99

(BBC B+ and Master compatible, except Master with Econet)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual)

Beeb Hand Scanner

Hand-held Scanner for the BBC Micro

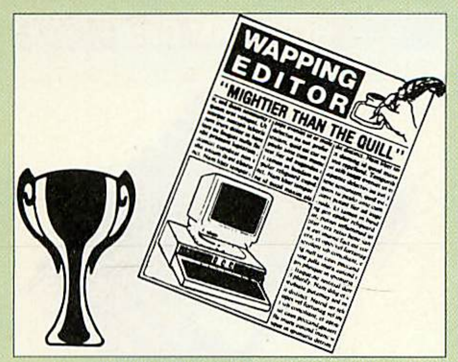


Watford Beeb HandScan is a compact unit which will allow photographs, diagrams, or any other documents to be digitised quickly and easily, to then be used in a desk top publishing package, art program, or even in your own Basic programs!

The HandScan plugs directly into the 1MHz bus on the BBC while a comprehensive set of utilities provided by the sophisticated ROM firmware. The scanner has a resolution of either 100 DPI or 200 DPI when accuracy is essential. Pictures as wide as 4" may be scanned in mode 0 and various types of dithering may be selected to simulate the grey levels of a scanned picture.

All necessary software has been included in the firmware to allow the scanner to read images directly into our Wapping Editor with little more than the click of the mouse. The digitised picture may then be incorporated into your magazine, newsletter, report or any other document.

Beeb HandScan & Firmware **£99**



Winner of the BBC Acorn User 1990 Award for the Best DTP/Word Processor

The Wapping Editor

The Wapping Editor from Watford Electronics represents a breakthrough in Desktop Publishing for the Beeb. The package includes a 64K ROM containing ALL the software needed to get into print fast; a very sophisticated graphics module, professional quality typesetting software, a word processor, a comprehensive font editor for designing your own typefaces, and a variety of printer dumps. This mouse-driven system is designed for the BBC B, the B+ and Master computers and will take full advantage of any Sideways and Shadow RAM that may be fitted. It will run under DFS, ADFS and Network filing systems and requires as a minimum just a single 40 track drive.

Included with the system is a utility disc containing several high quality fonts, various utilities and a ROM image of a Support ROM. A comprehensive 100 page manual completes the package. The Support ROM contains routines to allow an area to be rotated to any angle or distorted to any four-sided shape. Also included are facilities to draw ellipses at any angle and sectors, segments and arcs (in Master or BBC B with Acorn GXR). Another of the features of the Support ROM is a 'Turbo DFS' which gives DFS access times comparable with those of ADFS.

Page Layout Section

The Wapping Editor may be used to create pages of any size from an A6 to a full A3 page. If none of the eight default page types suit your purpose, the stand-alone page creation program may be used to create pages to your own requirements. By using proportionally spaced fonts and genuine microspacing it is possible to print over 150 characters across an A4 page. A unique feature of the Wapping Editor is the 'A5 x 2' page size allowing two A5 pages to be printed side by side onto a single A4 sheet.

The graphics module incorporates the facilities like: pencil, brush, airbrush, polygon, circle, eclipse, fill, cut & paste, etc.

Text may be typeset, either justified or unjustified, in any font anywhere on the page. Simply select which font and text document you wish to use, and pull out a rectangle on the page where you want the text to be – it's as simple as that! Multiple columns may be printed just as easily and a special 'expand' feature may be used to expand the microspacing so that the document exactly fits the space defined.

Word-Processor

The integral word processor is the ideal tool for producing your text documents, although text can of course be read in from any of the other popular word processors such as View, Wordwise etc.

The Font Editor

The font editor module will allow you to design your own typefaces or to modify the ones provided on the utility disc. This sophisticated editor has numerous functions designed to take the tedium and frustration out of producing good looking, well balanced fonts. Each character may be individually proportionally spaced and characters of any size up to 16 x 16 pixels may be defined.
Pictures may also be 'grabbed' from a video source by using the Watford BEEB Video Digitiser.

Wapping Editor Software Pack	**£59**
Wapping Editor plus Mouse	**£79**

(Wapping Editor only works with Master Compact if a Mertec Expansion box is fitted)

Wapping Art Disc

Over 250K of clip art to cut and paste into your Wapping Editor pages. Pictures include maps, transport, people, media, sport, games etc.
Two 'ratio' screens for use with hi-res and rotated A5 pages to ensure images are not distorted when printed out.

Music writing symbols in the form of pattern and brush for quick production of manuscripts are included together with staves.

There are two prepared hi-res pages layed out for printing labels, both single and double width. Ready made label designs are included but these can be easily replaced with your own designs.

A Mode 0 screen dump routine is also included. To pack such a large amount of data onto the discs the screens have been compressed and routines to compress and expand Mode 0 screens are included on both discs. Using the packing routine you can archive large numbers of screens onto a single disc.

£15

Wapping Font Disc 1

Sixteen additional fonts, including smaller version of Oberon and Daisy and two new sizes of the standard font for the Wapping editor.
Also included are three Mode 0 screens containing giant 'headline' fonts to cut and paste to create extra smooth headlines.
Supplied complete with instructions.

£12

Wapping Font Disc 2

This new addition to our Wapping range of DTP software provides you with additional 23 fonts for the Wapping Editor DTP pack. (80 track discs only).

£13

Archi A4 Scanner



This most advanced Archi A4 image scanner is supplied complete with ROM based podule software. Features provided include facilities for zooming in on an image and inverting the image in X and Y directions, saving and printing of the sprite created. Interactive help is supplied using the !HELP application on the Acorn applications discs. The 216mm scanning width can cope with both desktop scanning of single sheets, photographs, diagrams, etc., with its fast ten page automatic document feeder, but it can also detach from the feeder to become a convenient hand-held full page scanner for larger documents or pictures.
Scanned image control can be freely adjusted in increments of 10 dots per inch from 100 up to 400 dpi resolution with 64 levels of grey scaling. A built in shading controller and manual brightness control achieve optimum image clarity.
Unlike some scanners, which use a red light source, the Watford scanner uses a yellow/green source which vastly improves the light/dark contrast, thus eliminating the effect where any red-based colours are faded down to white and so do not show up in the scanned image.
All these features and facilities combine to make the Archi Page Scanner the fast and convenient way in which to add that extra impact, interest and clarity to documents, reports, instruction sheets, manuals, news letters, etc., from your Archimedes DTP package.

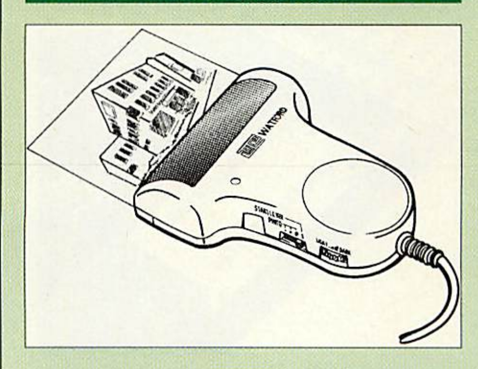
New Low Prices:

Archi A4 Scanner	£269
Sheet Feeder for above	£75
Scanner + Sheet Feeder	£359

Computer Concept Scanlight

• Scan-Light A4	£275
• Scan-Light A4 + Sheet Feeder	£368
• Scan-Light Junior mono	£130
• Scan-Light Junior 256	£197

Archi Mk II Hand Scanner



Watford Electronics is now able to offer a complete hand held scanning package, possibly the most essential addition to any desk top publishing system, for only £119. The package includes the most comprehensive utility software available for the Archimedes, a high quality hand held scanner, and all necessary documentation to get you going straight away.

SCANNER

The scanner is capable of scanning up to an amazing 400 dots per inch (DPI)! The scanning area is 4" wide, and the height is only limited by the maximum amount of memory available. The dot resolution may be switched to 100, 200, 300 or the maximum 400 dpi. One of four operating modes may be selected offering either pure monochrome scanning, or one of three grey level modes. The grey level modes use different size dither patterns to represent up to 16 shades of grey. There is also a dial to allow the "brightness" to be adjusted over a wide range, in order to optimise the quality for any specific image. The scanner interface is a standard, single width, expansion card (podule) which plugs into the Archimedes' backplane. The socket on the rear panel connects the scanner by 1.8 metres of cable.

SCANNER SOFTWARE

Full use is made of the windowing and the multi-tasking facilities of RiscOS. The software is supplied in a 64Kbyte ROM located on the interface board. The scanner appears as a small icon on the desktop icon bar, and the software is retrieved from the ROM simply by clicking on that icon. As you scan a page, the image appears in the scanning window on the screen, scrolling up in real time. The other facilities included in the software are.

Cropping and scaling to any size including stretching and squashing in X and Y direction separately.

Colour tinting.
X and Y flip.

Edge detection which turns solid objects into outlines.

Selective directional copying which allows features (i.e. lines or text) to be made thicker or thinner.

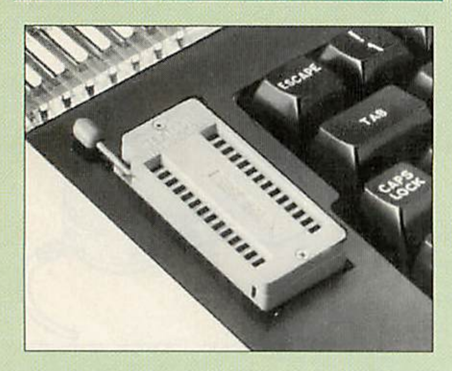
Scanned images may be saved as sprite files or transferred directly into other RiscOS applications (DTP, Draw, Paint) simply by dragging the sprite file into the application's window. Sprites may also be generated using anti-aliasing. This greatly improves picture quality and is particularly effective when scanning material with a range of grey tones, such as photographs. Images can be printed on any printer that is supported by a RiscOS printer driver, with optional settings for portrait or landscape modes, image scale and positioning. Images are printed using the full resolution of the printer and are not limited to the screen resolution.

On-screen help is provided via the RiscOS interactive help facility. Calls are also provided in the ROM for users wishing to write their own software, incorporating the use of the scanner.

AHS-4 Archi 300/400 Version	**£119**
AHS-3 Archi A3000 Version	**£129**

Continued→ → → → → → → → →

Sideways ROM ZIF Socket System



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

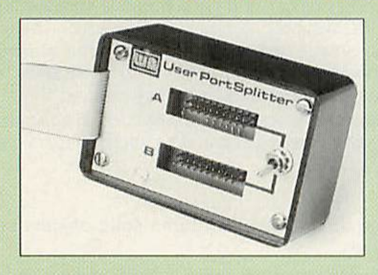
- Very simple to install. NO SOLDERING required. The ZIF eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- BBC, B and B+ compatible. **£18**

ROM Cartridges for the BBC Master

Will also accept the new larger Piggy Back ROMs like: Interword, Interbase, Quest, Conquest, etc

Twin **£8**; Quad **£13**

User Port Splitter Unit



Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaneously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination

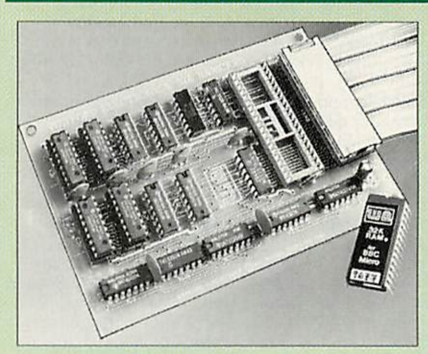
Excellent Value at **£22**

Aries B-488 IEEE-488 Interface Unit

The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB or 'HP IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

£238

32K Shadow RAM/Printer Buffer Card Expansion Board



A MUST FOR WORD PROCESSING

Simply plug the ribbon cable plug into the 6502 socket and gain a massive 32K of extra RAM.

- While word processing, you don't wait for a slow printer, type in text while printing and save on expensive printer buffers.
- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28K bytes free – 5 times as much as normal.
- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24k of text in memory. This product is recommended as an ideal complement by Computer Concepts.
- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20k of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28k of program space.
- Use the full 32k or the bottom 12K of the expansion RAM as a printer Buffer. (P.S. Only 12K printer buffer can be used with Wordwise & WW+, due to the way they are written).
- Unique facility to turn ROMs off and on again.

Only £54

(Price includes a comprehensive manual and the ROM)

- ARIES B-32 Shadow RAM Card **£55**

Commander Joystick



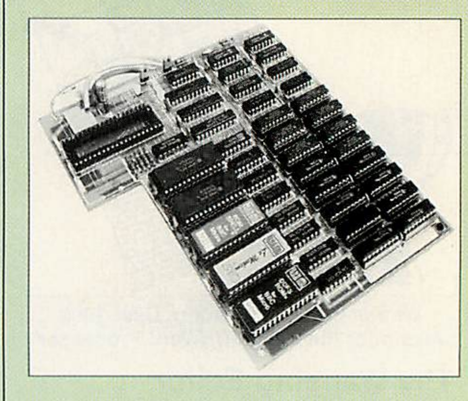
Watford Electronics' new Commander Joystick for the BBC B and Master 128K has a unique dual mode of operation giving selective free floating or self centring fully variable control in both X and Y axis directions. Commander is particularly good for flight simulation and drawing programs.

Features:

- Direct connection to BBC Analogue input port – no interface needed.
- Fully compatible with all BBC Joystick controlled games programmes.
- Switchable springs allow selection of floating or centring operation.
- Trim adjusters for both X and Y axes for fine centre adjustment.
- Convenient stick mounted fire button with additional base buttons.

Price: £15

ROM/RAM Card



- NO SOLDERING required to fit the board.
- Fully buffered for peace of mind.
- Compatible with BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM.
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- FREE utilities disc packed with software.
- Large printer buffer.
- UNIQUE fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROMSPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

PRICES:

- ROM/RAM card with 32k DRAM **£42**
- ROM/RAM card with 64k DRAM **£54**
- ROM/RAM card with a massive 128k DRAM **£89**

OPTIONAL EXTRAS:

- 16k plug-in Static RAM kit **£8**
- 16k DRAM for Upgrade **£13**
- Battery backup **£3**
- Read and Write protect switches **£2 each**
  Complete ROM-RAM card with all options fitted **£109**

Voltmace Joysticks

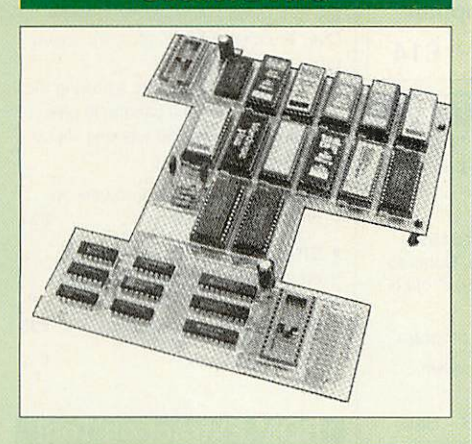
Delta 3B Single Joystick	**£10**
Delta 3B Twin Joysticks	**£15**
Delta 3C Joystick for Compact	**£10**
Delta 14B Single Joystick	**£11**
Delta 14B/1 Adaptor Module	**£12**
Transfer Software Disc-Tape	**£7**
Delta-Cat A mouse eliminator Joystick for the Archimedes	**£24**

Delta Base B



Analogue aircraft style yoke Joystick to run in the analogue port of the BBC B & Master 128 **£25**

Solderless Sideways ROM Socket Board



The key features of this no fuss, easy to install card are:

- Increases your BBC Micro's ROM capacity from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £35
Battery Backup fitted **£39**
Battery Backup only **£3**
16K Sideways RAM **£8**

- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer. **Only: £8**

BBC Educational Software

- Maths with a Story 1 (Disc). 4 primary level maths programs **£20.00**
- Maths with a Story 2 (Disc). 4 further maths programs. **£20.00**
- Picture Craft (Disc) 6-14 age group. Pack consists of flexible geometrical design & colouring programs. **£17.00**
- POLYMERS O-Level program. **£20.00**
- Classification & Periodic Table O-Level. The suite is supplied with its own database of chemical elements which can be classified according to your own rule. **£20.00**
- ADVANCED TELETEXT SYSTEM **£8.65**
- PERIOD TABLE SOFTWARE **£20.00**
- Computers at Work – Primary **£17.35**
- Electric Fields 6-14 years **£11.25**
- Espana Viva – 3 Discs **£19.95**
- WHITE KNIGHT Chess game **£16.00**
- A Vous La France **£29.00**
- **FUN SCHOOL 2 – Red:** Under 6 yrs **£12.00**
- **FUN SCHOOL 2 – Green:** 6-8 yrs **£12.25**
- **FUN SCHOOL 2 – Blue:** 8 yrs+ . **£12.50**
- **FUN SCHOOL 3 – Red** **£18.50**
- **FUN SCHOOL 3 – Green** **£18.50**
- **FUN SCHOOL 3 – Blue** **£18.50**
- Six French Games – Aimed at pupils in their first year of French, but also useful as revision for more advanced students 11 years+ **£26**
- More French Games – Another 6 games 12 years+ **£26**
- Au Restaurant and Accident de Route 12 years+ **£26**
- Boulogne and Oh-Les – 2 programs for beginners **£26**
- Letters to French Penpals – 11 years+ **£26**
- French Programs with Henri Beret – The programs in this series present vocabulary, grammar and role-play phrases in the form of animated games. 11-16 **£22**
- Six German Games – Aimed at pupils in their first year, but useful as revision for more advanced student of German. 12 years+ **£22**
- More German Games – Aimed at pupils in their 2nd year of learning German. 12 years+ **£22**
- An Introduction to Electronics – Brings together all the basic electronics required for a GCSE Physics or CDT course. 14-16 years **£26**
- Computer Control – This is a package of 3 programs simulating control of a greenhouse, a robotic arm & a chemical plant. 14-16 years **£26**
- PUNCMAN Learning punctuation
  Puncman 1 & 2 for 7 – 13 years **£15**
  Puncman 3 & 4 for 8 – 14 years **£15**
  Puncman 5 & 6 for 8 – 15 years **£15**
- Yes Chancellor – A chance to take over number 11 at Downing Street. 12 years+ **£18**
- Letters & Pictures – Introduces phonic skills to Infants 6-8 years **£15**
- Numbers & Pictures – Early number learning is a great fun (4-6 years) **£15**
- Note Invaders – Budding musicians can learn the notes on the Clef with this elegant game 3 programs (7 to Adults) **£15**
- Maps & landscapes No. 1 (9-14 years) **£18**
- Help Your Child learn Basic Map work No. 2 (9-14 years) **£18**
- Pirate – Educational Adventure (8-14 years) **£15**
- Spelling Week by Week (6-14 years) **£18**

Archimedes Software

- Animated Alphabet (3-6 yrs) **£21**
- Arcventure (8-12 yrs) **£29**
- Bookbinder **£43**
- Bumper Disc **£14**
- Bumper Disc 2 **£14**
- Craftshop 1 **£26**
- Craftshop 2 **£26**
- Converta-Key **£16**
- Data Word **£16**
- Desktop Stories **£35**
- DigiSim **£35**
- Dream Time (5-7 yrs) **£23**
- Droom **£19**
- Farm (5-7 yrs) **£19**
- Fleet Street Phantom (9-13 yrs) **£25**
- Fun School 2A Red (up to 6 years) **£12**
- Fun School 2A Green (6-8 years) **£14**
- Fun School 2A Blue (8 years +) **£14**
- Gate Array Teaching System **£68**
- Glimpse Clip Art Utility (7-16 yrs) **£8**
- Highlighter (6-16 yrs) **£42**
- Jiglet **£27**
- Jigsaw **£28**
- Mapventure (9-13 yrs) **£24**
- Microbugs **£24**
- Money Matters **£16**
- Nature Park Adventure (7-9 yrs) **£27**
- Numerator **£60**
- Picture Book **£16**
- Recall (6-13 yrs) **£39**
- Sellardore Tales **£24**
- Snippet **£26**
- Space Mission Mada (9-13 yrs) –
- Sting of the Dump (9-13 yrs) **£22**
- Target Maths **£16**
- Viewpoints (9-12 yrs) **£33**
- Wizard's Revenge (7-10 yrs) **£17**
- Worst Witch (7-10 yrs) **£25**

Connecting Leads

(All ready made and tested)

CASSETTE LEADS 7 pin DIN Plug	
to 3 pin DIN Plug + 1 Jack Plug	**£2.50**
to 7 pin DIN Plug	**£3.00**
to 3 Jack Plugs	**£2.50**
6 pin DIN to 6 pin DIN Plug (RGB)	**£3.00**

Disc Drive Power Leads

Supply from BBC power supply to standard Disc Drive Connection: Single **£3.00;** Dual **£3.75**

Disc Drive Interface Leads

BBC to Disc Drives Ribbon Cable
Single **£4** Twin **£6**

Miscellaneous Connectors

	Plugs	Sockets
RGB (6 PIN DIN)	50p	75p
RS423 (5 pin Domino)	70p	80p
Cassette (7 pin DIN)	40p	95p
ECONET (5 pin DIN)	35p	50p
Paddles (15 pin 'D')	150p	250p
Disc Drive Plug 4 way	100p	–
6 way Power Connector	120p	150p

Watford DATA DUCK

Convert two single Disc Drives into one Dual Drive with this simple external unit (Suitable for Disc Drives with PSU. For Disc Drives without PSU, you will also require Watford Power Duck, see below). **£14**

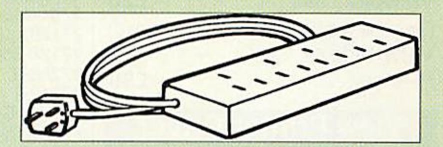
Watford POWER DUCK **£8**

Surge Protector Plug

Fitted in place of your normal mains plug, this device protects your equipment (and data from corruption), against mains high voltage translent spikes/surges caused by lightening or thermostats switching.

Protection for only **£8.50**

4 Way Mains Distribution Socket



4 way top quality mains trailing sockets.
Supplied wired up with mains plug ready for use.
Can be screwed to floor or wall if required.
Very useful for tidying up all the mains leads from your peripherals.
£9.50

Aries Spike Cleaner Unit

A 4 way mains distribution unit as above with a built-in Surge Arrester, providing protection for your complete Computer/Hi-Fi System
£16

28pin DIL Header Plug

SOLDER type **£1.50** IDC CRIMP type **£1.95**

8 Way DIP Switch

Increase the speed of your Disc Drives by soldering this switch to your BBC B or B+ keyboard

Only **£1.00**

28 pin ZIF SOCKET (Textool) **£6.95**

Continued→ → → → → → → → → →

Computer Concept's ROMS

Disc Doctor	£18
Inter BASE	£49
Inter CHART	£25
Inter SHEET	£37
Inter WORD	£36
Mega-3 ROM	£76
Spell Master	£42

Wordwise plus

£40

We are giving away absolutely **FREE**, the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

This advance utilities ROM extends the power of your Wordwise plus ROM.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear test-segment area.
- BBC B, B+ and Master compatible.

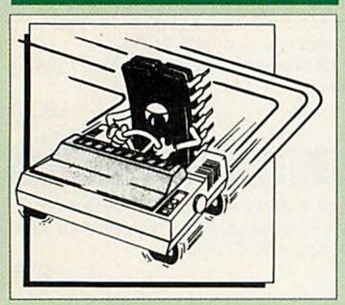
Only **£24**

(N.B. Word Aid requires a Disc interface in your Micro)

Acorn ROMS

View 3.0 ROM	£45
Viewsheet (Acornsoft)	£36
Viewstore	£36
Viewspell – 80T disc	£25
Viewplot Disc	£20
(Please specify for Master 128 or Compact)	
View-Index	£12
Hi-View	£38

View Printer Driver ROM



View is a powerful word processor, but it seriously lacks in terms of printer driver support. With the View Printer Driver ROM, the View users will find themselves in the realms of advanced word processing.

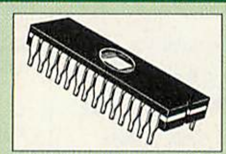
Price: Only £29

Mini Office 2 – Disc

for BBC B & B+	£12
for BBC Master	£14
for BBC Compact	£16

(When ordering please specify for which Micro & 40 or 80T Disc)

Assorted ROMS



ACORN ADFS	£25
ACORN BASIC 2 plus User Guide	£22
Acorn BCPL	£42
ACORN DNFS	£17
Acorn FORTH	£32
Acorn Graphics	£25
Acornsoft C Disc	£36
Acorn LISP	£19
Acorn OS B+	£25
Acorn OS 1.2	£14
Basic Editor	£24
Beebmon	£22
Communicator	£49
Dump Out 3	£25
Graphics Extension Rom	
GXR-B	£21
GXR-B+	£22
Logotron LOGO	£43
MASTER OS ROM	£38
Master ULA (47)	£15
Master ULA (60)	£10
Micro Prolog	£25
Microtext Disc	£46
Microtext Rom	£199
Numerator – Archi	£69
Numerator – BBC	£39
Pendown ROM	£32
Rom Manager	£20
SERIAL ULA	£13
TED	£35
Termulator B, B+	£28
Termulator Master	£32
Video ULA	£14
1Mb OS ROM	£39

CHIP SHOP

1 MB-10 DIL D-RAM	£4.50
1 MB ZIF D-RAM	£4.00
256K x 4-8 DIP	£4.75
256K x 4-8 ZIF	£4.00
SIMs and SIPs	
256 x 9-8	£11
1Mb x 9-10	£26
1Mb x 9-8	£39
DS3691	£4.50
DS88LS120	£5.25
LM324	£0.45
SN76489	£5.50
SAA5050	£8.75
UPD7002	£6.00
2764-250nS	£3.00
27128A-250n (12V5)	£2.50
27128-250nS (21V)	£4.00
27256-2	£3.00
27512-2	£4.50
27C101G (1 Meg)	£7.00
4013	75p
4020	£1.00
4164-10	£1.55
4464-10	£3.50
4816 RAM	£2.00
41256-8	£2.00
41256-10	£1.50
6264LP-8K	£4.00
6502A CPU	£5.00
65C02 3M	£9.75
65C12	£9.00
6512A	£10.00
6522	£4.00
6522A	£5.00
62256ALS-15	£10.00
62256P-12	£8.50
6818	£4.00
6845SP	£6.00
68B50	£2.95
68B54	£7.50
7438	50p
74LS00	50p
74LS04	50p
74LS10	50p
74LS123	£1.00
74LS163	£1.00
74LS244	£1.00
74LS245	£1.00
74ALS245	£2.75
74LS373	£1.00
74LS393	£1.00
75453	£1.00
75159	£3.00
8271	£39
9637	£2.00
ICL7673PA	£3.00

Acorn Speech Synthesizer package complete, for the BBC B Microcomputer

Special Offer £14

OFFICE MASTER

CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/ partnership business.

FINAL ACCOUNTS – Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program.

EASILEDGER – Provides instant management information.

INVOICES & STATEMENTS – Has VAT routines and footer messages facility.

All this for only **£21** (Disc)

OFFICE MATE

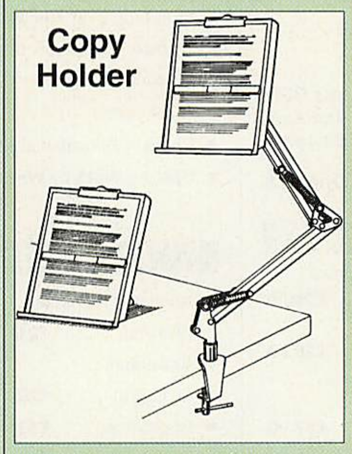
DATABASE – Set up a computerised card index system with powerful search facilities.

SPREADSHEET – Offers many calculation and editing features

BEEBPLOT – Provides visual representation from Spreadsheet data.

Only £10 (Disc)

Copy Holder



Whether you want to type in your latest program or the draft of a new trilogy, Watford's manuscript holders are superb for holding your paper at the ideal height and angle to allow you to read and type in ease and comfort.

Available in 2 full A4 versions, desk resting and shelf clamping. Paper is held firmly by means of a plastic retaining ruler and a clip grip.

Desk Top **£8**

Angle poise **£12**



Copy holders as above but with a battery operated, remote controlled cursor/ruler. (By hand or foot pedal.) (Batteries 2 x AA not included.)

Desk Top **£15**

Angle poise **£20**

VISA

CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234 or 33383

TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs!

The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast.

- **ERASER EB** – Standard version erases up to 16 chips. £34
- **ERASER GT** – Deluxe version erases up to 18 chips. Has automatic safety cut-off to switch off the UV lamp when opened. £36
- Spare UV tubes. £12

ROM Extraction Tool

This extremely useful tool allows you trouble free chip insertion and removal from your computer by distributing the removal force over the whole body of any 24 or 28 pin chip. **£2**

Metal Chip Extractor **£3**

Servisol Foam Cleaner

This king size multipurpose foam cleaner spray is ideal for cleaning Keyboard, Monitor, Disc Drive & Computer furniture surfaces.

£2.50

Antistatic Aerosol Spray

Ideal for cleaning and preventing static build-up on TV/Monitor Screens.

£2.50

Aerosol Dust Spray

Ideal for removing dust & dirt from Keyboard & similar inaccessible spaces. **£3**

PC Cleaning Kit

To avoid data corruption and trouble free use of your PCs, it is advisable to clean your PC System once a week. Our Kit 14 is ideal for the purpose.

Kit 14 – 1 each, 3.5" & 5.25" Cleaning Disk, 2 cleaning pads; Drive head cleaning fluid; 20pcs general purpose wipes; Anti-static screen cleaning fluid; General surface cleaning fluid and a transparent plastic case which can hold ten 5.25" Disks when empty. **£10**

Spares for BBC Micro

UHF Modulator	£4
Speaker Grill	£1
Speaker	£3
Keyswitch	£1.50
Master PSU	£59
Master Keyboard	£62
Master Casing	£49
16MHz Crystal	£2
17.734 MHz Xtal	£2
32.768MHz Xtal	£1
BBC B Refurbish Casing	£25
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New Release

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'ACORN TO PC' is written clearly and concisely by Dr. John Lockley, who has wide experience of writing and broadcasting. He is currently appearing as a regular contributor on Radio 5, and is co-author of 'The Complete BBC Computer User Handbook'.

Price: £12.95 (No VAT)

The Complete BBC Computer User Handbook

If you own a BBC B, B+, Electron, Master 128 or Master Compact, or Archimedes, then this is the book for you. It shows how to get the best from your machine, and how to make it work for you. The general style and level of presentation means that both the expert and beginner alike will feel comfortable with the quality and quantity of the material.

Subjects covered include the general use of computers, hardware design and peripheral devices like printers, disc drives, etc, and Networking. Programming hints and tips and various disciplines for making a better program are discussed in some detail, including debugging of specific errors. Standard programs are covered, such as wordprocessors, spreadsheets, databases, graphics, communications, etc., which brings you neatly on to the subject of using computers in the office or at work – even giving advice on writing and marketing your own programs.

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It is possible to gain a full understanding of the mouse from this manual. For those not interested in exactly how the mouse functions, complete example programs are also included.

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Now what do you do, when this £400 piece of high technology refuses even to move its head, and you have stayed up until 2 in the morning with copious supplies of coffee, desperately trying to print something out? Once again, Watford Electronics comes to your help with our new book entitled 'THE EPSON FX-KAGA PRINTER COMMANDS REVEALED'.

This book describes in plain, easy to understand English, how to use and make the most of your KP810, PW1080A or any other Epson FX80 compatible printers like Panasonic KX-P1080/1, etc., with the BBC Micro, both from Basic and Wordwise.

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- Drives can be individually write protected
- Up to four drives over multiple cards
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- !IDEFSDisk, creates PC emulator hard discs

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For A3000 users an additional external Case and PSU will be required.

AAA 0300 External Case & PSU for A3000 **£85**

Internal Hard Disc Drives for A3000

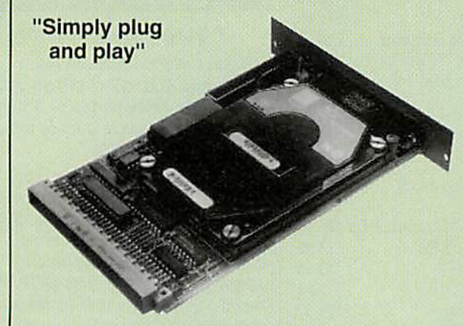
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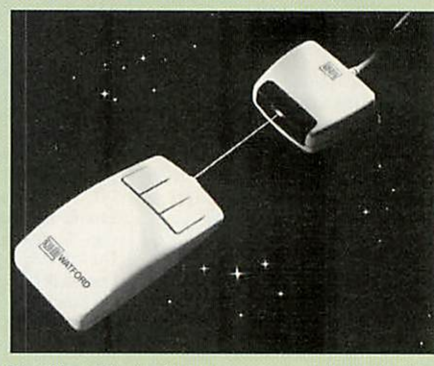
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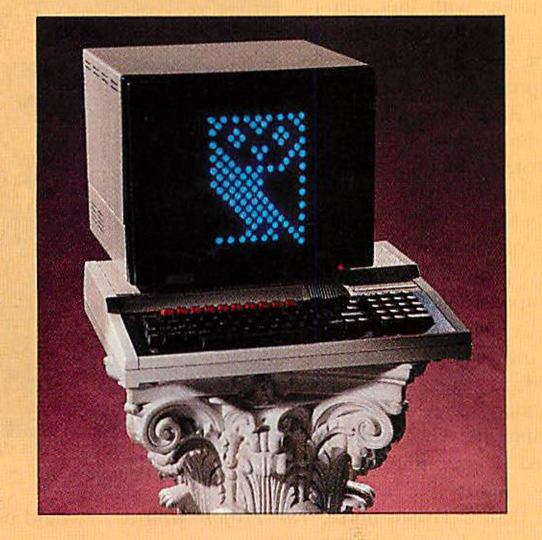
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BBC MICRO

TEN YEARS ON

WELCOME to a special *BBC Acorn User* supplement charting a decade of the BBC micro computer. It is ten years since the start of the BBC's computer literacy project, which encompassed television and radio programmes, software – and, of course, led to the development and launch of the BBC micro. Ten years on, the project has been celebrated in a special BBC programme, *The Trojan Mouse* (BBC 1, April 5 at 10.30am, due to be repeated in the near future). The BBC micro, made by Acorn, is still sold today in the form of the eight-bit Master 128 and newer 32-bit BBC A3000. During the last 10 years, over one million BBC micros have been sold, with over one-third purchased by schools, where it has continued to dominate. In short, we have become one of the most computer-literate nations in Europe. Few would disagree that the BBC micro helped to kick-start the personal computing revolution. In the late 70s, the world of computers was largely shrouded in mystery and available only to a select few. Because of this, the BBC carried out some research and subsequently put its broadcasting muscle behind the computer literacy project, which spawned the BBC micro. The story of the BBC micro is one of both successes and failures. While first out of the trap with huge sales of the BBC micro, Acorn was soon up against the might of IBM on the business front and Amstrad on the home front. With Commodore, Atari *et al* coming into the market with 16-bit games-based machines, progress over the last decade has been at a frightening pace. Undoubtedly Acorn has made a significant contribution to the advancement of computing during the last decade. And having formed a company with Apple and VLSI – Arm Ltd – to develop chip technology, Acorn has a role to play in the future. So, what of the future of the BBC micro itself? Well, it continues to dominate education and is making in-roads into the home market via The Learning Curve, and rumours still abound about a new portable, which could have a BBC badge. Meanwhile, this special supplement looks at the computer literacy project, the TV programmes, the key Acorn developments, the impact in schools, and how the BBC micro changed people's lives.



INSIDE THE TROJAN MOUSE

Producer, Dave Thomas, takes us behind the scenes of a BBC project

ORIGINS

David Allen, the original editor of the BBC computer literacy project and producer of Making the most of the micro, explains the origins of the campaign.

I know it's difficult to believe, but the BBC micro wasn't dreamed up to make money. Its pre-Thatcherite origins are buried deep in the public service broadcasting ethic and they were far from commercial. In 1979, my head of department said to me over a drink: "There's a lot of talk about the impact of something called microelectronics. Would you like to see if there's anything in it?"

A visit to Professor John Ashworth,who headed the Government's think tank, started us on an extensive research project which convinced us that there certainly was 'something in it'. There was a good deal of concern about the social and industrial impact of ever-cheaper computer hardware, and about the country's lack of awareness either of the dangers, or of the potential, of the micro.

The Germans were calling the micro chip 'The Job Killer' but they were already incorporating it into their products and industrial processes. We, in contrast, seemed to be doing nothing.

The overriding message of our research was that some kind of educational campaign was needed – rather like On the Move, the adult literacy campaign of the mid-70s.

A computer literacy project might help people to overcome their ignorance and fear of computers by learning to use them in a variety of creative ways. We would provide television programmes, books, courses, software and related hardware – the BBC micro.

Ten years ago a new programme appeared on the nation's TV screens, dealing with what had become a national talking point, the computer. And in the same programme, the first of a new and exciting breed of machines made its screen debut – none other than the BBC microcomputer.

The Computer Programme marked the beginning of the BBC computer literacy project, in itself a unique concept. The project wanted to make computing accessible to everyone, and over the years many programs were made with this aim in mind. A decade later I became the producer of the latest program, known as *The Trojan Mouse*, which was to mark the tenth anniversary of the project, looking back at what it has achieved.

Probably the greatest legacy of the BBC computer literacy project has been its effect upon education. A comment by one teacher I met while making the programme seemed to sum it up. The BBC micro, she told us, had crept into the classroom and changed everything, but quietly, more like a Trojan mouse than a Trojan horse. *The Trojan Mouse* subsequently became the title of the programme.



Presenter Ian McNaught Davis with Steve the robot dummy

EARLY DECISIONS

One decision that had to be made for the anniversary programme was, who should present it? This choice was a simple one. Ian McNaught Davis had spent his entire working life in the computer industry and presented many of the original computer literacy programmes.

I thought it was most important to show how much has changed in ten years. We have progressed from a world where computers were rare objects, used by a few professionals and scientists, to one where they are more common than typewriters and are used regularly by almost every school child in the country.

But also involved in the story was the rise of a small company in Cambridge called Acorn, which was awarded the contract to supply 12,000 computers to accompany the television series. This unique and controversial partnership created the original BBC microcomputer – a vital component of the project. So it seemed that the programme would fall into three parts: how the computer literacy project and the BBC micro came into being; the impact that both had, which exceeded all expectations; and finally the long term effects of the project.

DOWN TO BUSINESS

Above all, the programme had to be a story about *people*, those who saw what they could do with a few tiny chips of silicon and those with a vision for what those tiny chips could do for them. And so, armed with the basic aims of the programme, the real planning began. Straight away, I was presented with a decision that had to be made quickly.

I wanted to show the contrast between the traditional mainframe computer, hidden away in a large room tended by a priesthood of experts and engineers, and the microcomputer, which has put computing into the hands of millions of ordinary people. Ian McNaught Davis (better known to many viewers as Mac) knew of a mainframe computer that just happened to have its air conditioning plant monitored by a BBC B. It was too good to be true and in a few weeks time it would be too late. The mainframe was about to be closed down. I had originally planned to record the programme in February this year, but this sequence couldn't wait.

We already knew roughly how it would fit into the programme, but the detailed script for it still had to be written. Television presenters may look as though they are speaking off the cuff but, for a programme like this, every word needs to be carefully chosen and learnt by heart. However, before we could record this sequence, there was something that needed our attention even more urgently.

The BBC computer literacy project was designed to allow ordinary people to get to grips with the micro, so the programme needed to include as many of these people as possible. The problem is that most of the interesting things that people do with computers happen in the privacy of their own homes. Playing games, intellectual or otherwise, writing plays, making music... all over the country, people are using computers, but I could hardly start ringing door bells at random, nor could I stretch the budget too much by travelling far and wide.

ON THE ROAD

But, if I couldn't go to them, there was a place where they could come to me, namely the 1991 *BBC Acorn User* Show, held last autumn. A few phone calls to book a film crew were followed by a visit to the show at Wembley and, on the final day of the show, we did the rounds. That day, many an unsuspecting visitor had a microphone and a camera aimed at them, and they were asked to recount their computing tales.

These on-the-spot interviews are known in the trade as 'vox pops', short for *vox populi* – a technique that is familiar to anyone who watches programmes like *That's Life*. We wanted to capture some of the excitement and enthusiasm that microcomputers are still capable of generating and this proved a good way to do it.

After these filming sessions, we were then able to work out the details for the rest of the programme. The most exciting part of making a television programme is going out with a camera crew, to turn ideas into pictures and sounds. But the most interesting part comes earlier, when you find and meet the people who may take part in the programme.



Nerve-racking: anything could happen on the set of Micro Live



TALKING HEADS

For the first part of the programme there were several possibilities. Many people had a strong impact on the early days of the project, such as David Allen, computer literacy project editor.

Others, such as Roger Wilson and Steve Furber, the designers of the BBC micro, provided an fascinating insight into the technical developments – from tales of designing their own computers as students at Cambridge, right


The camera crew visiting a school in Cambridge

up to the problems they had five years later when they had to get the first BBC micro to work in time for the television programmes.

Then there were those people who had been affected by the project. The *BBC Acorn User* Show had given a flavour of this, and now it was time to look at the effects in greater detail.

As always, the most difficult decision was who to leave out. A thirty minute programme is not long enough to look at everything and a few people have to stand in for the rest. Should I choose the Cambridge vicar, Rev Philip Foster (see page 54) who started out with a BBC B to compose his sermons and ended up using a DTP package on the Archimedes to produce a professional looking magazine? Or the journalist who writes for a national newspaper and downloads it each week straight into the paper's typesetting system from his west London study? Or the medical scientist who uses the extraordinary speed of the Archimedes to analyse moving images of the human eye, in greater detail than ever allowed before? Or those people who, ten years on, find that a BBC B with just 32K of memory can still do extraordinary things?

As well as talking to the people involved with and affected by the project, another area of my research was to view as many of the original literacy programmes as possible and find some suitable extracts. The literacy project was based around a number of television series which ran over six years and sadly I had to leave out some of my own favourite moments of *Micro Live*.

In all of these areas, time was of the essence, but one area merited particular attention within the program and that topic was education.

IN THE CLASSROOM

When microcomputers became available in schools in large numbers, many youngsters already had them at home, but mostly for playing games on, not as tools to be used. They were used far more by boys than by girls – there was even evidence that early experiences of computers as 'toys for the boys' made many girls unwilling to take up computing as a career in later years. If one effect of the computer literacy project was to deter girls from using computers, then that would be a serious failing.

So it was clear that I needed to devote part of the programme to how computers are used in schools today. Britain still has more computers in schools than almost any other country, but it is the way that they have been used that has been important. Where they have been well applied by teachers, computers have made classrooms far more exciting places to be and the computer that has made that possible was,

COMMISSIONING THE BBC MICRO

The computer literacy project required some kind of linked microcomputer – but what? We needed a machine to use systematically in the television programmes, but there was a Tower of Babel in the world of programming, with all machines using different versions of Basic, none of them perfect.

We called a meeting of all the manufacturers to see if they could implement what we had called ABC – Adopted Basic for Computers – on their machines. Nothing came of this and, eventually, ABC became BBC Basic and we had to commission our own machine. We sent an outline specification to all the UK micro manufacturers asking them whether they could meet it by modifying their existing or upcoming products.

From the innumerable replies, Acorn won the contract. The company was to modify a machine it was developing, called the Proton, to produce the machine we wanted to call the BBC micro. Our aim was a rugged, versatile machine, able to display high resolution graphics, run teletext, play music, speak, control external devices – the lot. And we wanted a lot of software to be available with it.



It is difficult to believe that in 1981, when the Welcome Pack for the original BBC Micro was commissioned, it was a novelty to have any screen layout at all. Most of the computer software of the time used scrolling green text on black screens.

Colour? Graphics? Different sized text? Sound? These were novelties. Now, ten years later such things are commonplace.

David Allen

USING THE BBC MICRO IN THE TELEVISION SERIES



When the first television series, The Computer Programme, was being made, studio days were fraught with technical problems as prototype machines were coaxed into action, often with the visible machine linked by masses of wires to development systems off-camera. It wasn't until the second series, Making the Most of the Micro, that the machine settled down and we could use it confidently to show the enormous range of things you could do with it yourself.

Throughout the series we tried to explain principles and, to do this, special software and DIY exercises had to be written each week. This covered communications, word processing, databases, spreadsheets, control, artificial intelligence, music, graphics – the lot. The BBC machine turned out to be an ideal vehicle for all of this. And it had another advantage. Until recently it has been very difficult to point a camera at, say, an IBM or a Macintosh machine and get a decent video image – the screens refresh at the wrong rate and appear to flicker. The BBC micro was the only machine which we could use as a direct video source in the studio, thanks to some ingenious circuitry created by BBC engineers.

At the end of the second series we broadcast a two-hour special on BBC1 called Making the Most of the Micro – Live! Viewers 'phoned in with questions, there was a live software writing challenge in the studio and the then Minister for Information Technology, Kenneth Baker, launched a nationwide schools software competition. We even had a demonstration of electronic mail which was actually infiltrated by hackers – live on air.

One of the most intellectually demanding series I ever produced was Computers in Control, a series which used the BBC machine endlessly to illustrate the principles of robotics. We even had it controlling a robot dummy called Steve. Recorded in Birmingham, this was full of technical challenges. The idea, as with all the series, was to show applications in the real world, then explain the principles using some simple code and related studio demonstrations and make these available to viewers. One of the bizarre spin offs (although not quite as bizarre as Steve) was a robotics kit called the BBC Buggy which could move around, mapping its environment or finding its way out of a maze. A second live one-hour special in 1984 led to the idea of Micro Live!, a magazine series which ran in the early evening on BBC 2 for three years from 1985 and which attempted to cover the whole range of information technology. In retrospect, this series was immensely vulnerable to gremlins – running live demonstrations of specially-written software is extremely hazardous, but things never went disastrously wrong and Fred Harris never had to use the emergency item which he always had with him.

We didn't exactly end up with nervous breakdowns, but we did add computers to the well-known media warning – never work with animals or children.

David Allen

and still is, the BBC micro. There are many different sides to computing in schools and deciding which aspects to include in the programme was not easy.

Computers can be used in many ways: allowing direct communication with the rest of the world; making history come to life; giving children with disabilities a chance to have more control over their world and, above all, as an educational tool with limitless possibilities.

What I hope we were able to show in this relatively short programme was that computers have become a familiar part of the average classroom. It is all a far cry from the early fears that computers would become teaching machines, replacing the human teacher and feeding information into rows of passive pupils.

ONE STEP BEYOND

Any look back at the computer literacy project also needed to reflect what is happening *now*. The world of the micro has moved on from eight-bit machines to those such as the 32-bit BBC A3000 and Archimedes, which can handle full motion video and CD-quality sound. The fact that Britain still retains not just a foothold but a lead in some areas, must be partly due to the decisions made by the BBC a decade ago. And the most obvious legacy of the project are the computers that it helped to give birth to.

Although the effects of the television programmes are less visible, showing the age of the microcomputer as something to be actively involved in, rather than helplessly observed, was of long-term importance. Above all, although computers are objects that can be held, touched and of course filmed, however much you know about computers in theory, the only way to really appreciate them is to try them out for yourself. That was the fundamental idea behind the BBC computer literacy project and it is still just as true today.

BIOGRAPHICAL NOTE



Dave Thomas, the author of this piece is a producer for the BBC's Continuing Education and Training Department. In addition to producing *The Trojan Mouse*, he has also been involved in the computer literacy project as a film and studio director in the final series of *Micro Live*.

Dave Thomas' first micro was the ZX80, followed by a Spectrum, but he wrote most of his *Micro Live* scripts on a BBC B and now he uses a variety of computers, ranging from an Aries Notebook to an Archimedes 440.

TV DETAILS

The Trojan Mouse, shown on April 5th 1992, will be repeated in the near future – see BBC Acorn User for details of the transmission dates. The BBC will be continuing its computer literacy programming with a new series called Computers for the Terrified, due to be shown next year.

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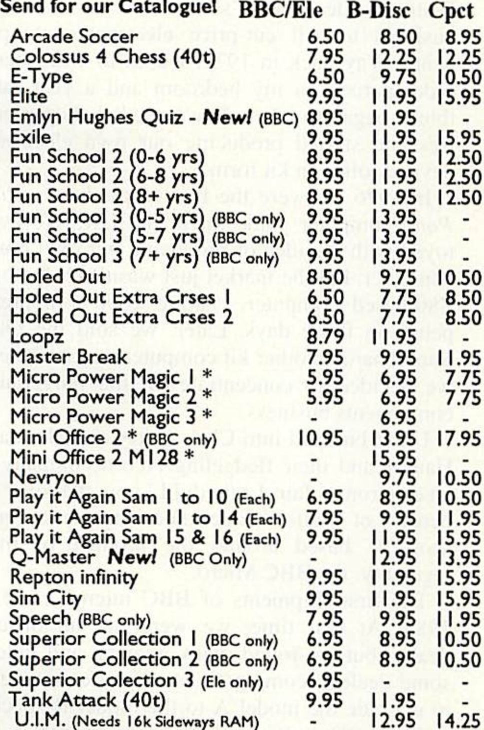
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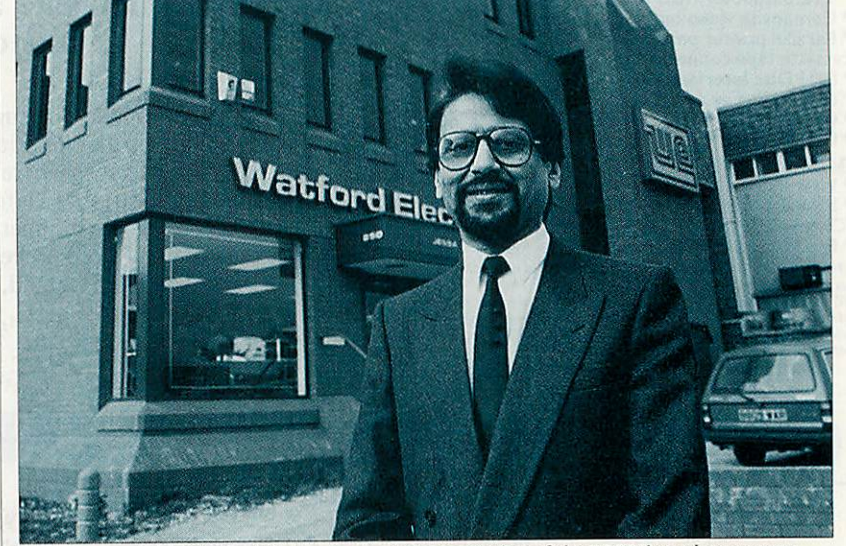
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LIFE STORIES

Three very different devotees to the BBC micro tell how it has changed their lives

NAZIR JESSA
Founder of Watford Electronics



Nazir Jessa outside Watford Electronics: in at the beginning of the BBC Micro phenomenon

Watford Electronics started life as a small business to sell cut-price electronics components. Way back in 1972, I used to wrap mail-order parcels in my bedroom and a year later things began to take off; we needed shop premises and started producing our own electronic devices, often in kit form.

In 1976 we were the first to produce a *Ping Pong* computer game kit in the UK. We even toyed with the idea of producing our own home computer, but the market just wasn't ready for a Z80-based computer, costing £600 – a pretty penny in those days. Later, we sold the Ohio Superboard, another kit computer, but in the end we decided to concentrate on the burgeoning components business.

I first bumped into Chris Curry and Hermann Hauser and their fledgeling Acorn company at an electronics fair. Little did I know that over 80 percent of Watford Electronics' business would soon be based around the product of their ingenuity: the BBC Micro.

The first shipments of BBC micros came in 1983. At that time, we were not an official dealer, but we found many owners, and indeed some dealers, coming to us to buy components to upgrade the model A to the model B specification. Our off-the-shelf components were cheaper than the official Acorn upgrade kit and, from that moment on, we never looked back.

We cornered the market for the BBC micro's non-standard printer cable and this led to burgeoning printer sales. Then we found that customers wanted a cheaper, better alternative to the Acorn DFS. One of our customers, Andy Bray, wrote the Watford DFS and we combined our components expertise with the software to produce one of the best selling DFS upgrades for the BBC Micro, along with plenty of disc drives. In just six months, BBC-related business came to dominate Watford Electronics.

We planned our custom-built HQ in Watford before the BBC phenomenon, thinking it would be good enough for life. Now, just a few years later, we have had to double our storage space. Much of our business is now PC related, but the BBC Micro's successor, the Archimedes, is as important as ever.

Nazir Jessa is managing director of the expanding company, Watford Electronics

'It revitalised tired teachers with its promise to bring excitement into the classroom'

MIKE MATSON
Co-founder of 4Mation Software

It was well after midnight, just before Christmas 1982. Like all new programmers, I'd spent hours wondering why my machine was so utterly stupid. Perhaps it was me. Perhaps teaching yourself to program when you're in your mid-30s wasn't such a good idea. But I had to do it – I was a teacher and I had promised my school that the Beeb would change things...

And it would have been easy, if there had been any software, but in those days there was only one way to get it, and that was to write it! During the pre-Beeb years, I was able to indulge in the simple pleasures of Morris dancing, home brewing, compost making, flying saucer hunting, reading Thomas Hardy, corn dolly manufacture, pagan spring rituals and car maintenance. Since the arrival of my Beeb a few months earlier, there had been no time for any of that, and nor would there be ever again.

Save your work often – a bit of a joke when your program takes thirty minutes to save onto cassette tape. But it's not a joke when the tape comes to an end after 29 minutes and you've no other tape handy. Pink Floyd made the ultimate sacrifice that night, but my Beeb was pleased with my offering. It spoke to me. I'd had the feeling for quite a while that there was magic in

that machine. Okay, maybe not in the machine itself, but in the way it got the imagination going, and in the way it revitalised tired teachers with its promise to bring excitement into the classroom.

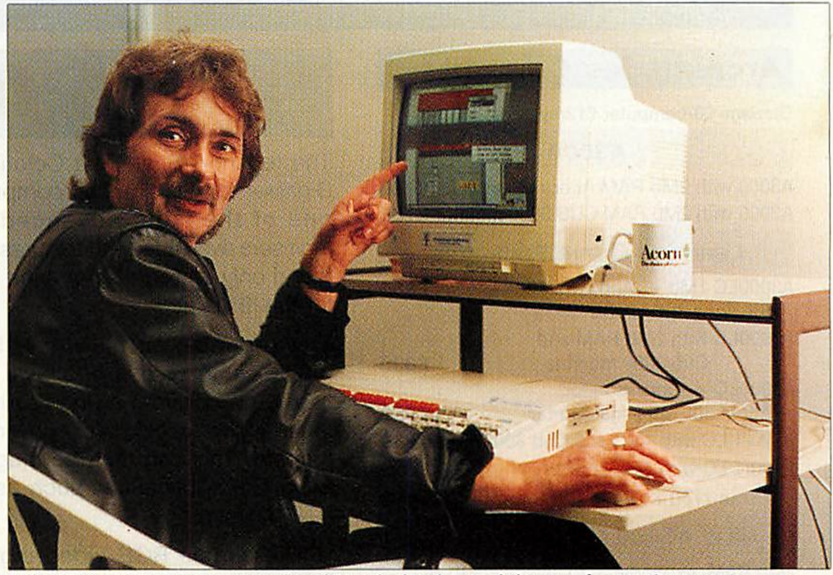
But speaking to me, that was something new – and in the early hours of the morning, a little frightening as well. It told me to go to an address on the other side of town. I didn't go, but I think a cab did. It never spoke to me again.

If I'd known then that the Beeb was going to change my life completely I would have been even more frightened. We capricorns are cautious people, we take no chances and we keep our feet firmly on the ground. But, according to those who know about such things, every 11 years our logical brains get zapped by emanations from sun spots and we start running across the road without looking. Or we give up our secure careers as teachers to set up a software publishing companies. Neil Souch gave up his career as a fire officer and I escaped from the classroom. 4Mation was born.

If the Beeb had never been, I would have missed some interesting happenings. I would never have heard those words: 'You're a very attractive boy' from a psychologist in Bulgaria. I would have missed the chance to swap passports with a professor from Moscow, or be deported from the USA with Dave Clare and Acorn's Sue Wall, or almost cause a border incident in Cyprus with Brian Richardson of CSH, or be interviewed on radio and television in Australia and New Zealand.

Ten years on, 4Mation not only survives, but thrives. The hours don't get any shorter, although I no longer spend my time programming. Thomas Hardy still waits to be read, the car gets maintained by someone else, and the Mayday maidens that I once knew, now live in dread of their own daughters becoming teenagers. The magic of the Beeb is just a memory. It can never happen again.

Mike Matson looks after software development at 4Mation, an educational software company



Mike Matson: programming replaced Morris dancing and the art of car maintenance

REVEREND PHILIP FOSTER
Early BBC enthusiast


Reverend Philip Foster

'I can still remember that dreadful Sunday morning when my Beeb crashed with the Sunday sermon inside it'

I can still remember my first contact with new technology when, as a curate in Marple, I wanted some means of getting text onto video tape, for church and home videos. Someone said: 'I think perhaps a computer might help.' So I bought my first machine, an Electron, for about £100.

It had to be an Electron because, although I'd heard that BBC Bs were good, they were not designed for a curate's stipend. Then I discovered that my Electron could do others things, like word processing and running a simple database – invaluable during Billy Graham's Mission England visit to Sheffield.

Looking back, it was primitive stuff. I was ignorant, the computer limited – many a time I rang more computer-literate friends with the plea: 'Help, I'm stuck. How do I..?' And, bless 'em, many a time they helped me out. By this time I was well on my way. Add-ons began to multiply until my Electron was literally creaking with them. So, a couple years later, when I moved to Cambridge, I bought a secondhand BBC. Finally I was able to breathe a bit more freely; it could run a decent database, had Mode 7 and there were even more add-ons available, thanks to good old Watford Electronics.

It could also run a Genlock board so that I could actually overlay text on to video pictures – something I had wanted to do for ages. Sermons multiplied on discs and I still remember that dreadful Sunday morning when my Beeb crashed with the Sunday sermon inside it. I really needed the Holy Spirit that day!

Not having a secretary meant that the computer was invaluable for doing notice sheets, parish newsletters, address lists – all the obvious things. Then about a year ago, after an exciting church weekend away, we decided to start publishing a parish community magazine that would *really* make people sit up and take notice. One of the team had access to an Archimedes, and before long we were producing the new 30-page magazine on it, using *Impression.* But we could only borrow the Arc for limited periods and so, after much bank balance searching, I decided to make the upgrade.

It was as if, suddenly, I didn't need to pedal anymore. On the Arc, things just happened with a click of the mouse. It was not long before my son (aged 10) worked and saved and cajoled me until – with a little help – he had a BBC A3000 of his own. It was actually self-preservation on my part – I wanted to call my study my own again. Before long, he too caught the publishing bug and started running a children's church magazine, with a couple of friends, on *Impression Junior.*

I still have the old Beeb – it makes an ideal second keyboard on DTP evenings and the magazine has gone from strength to strength winning, somewhat incestuously, the Best Parish Magazine of the Year award from the Christian Initiative Trust. So much then, for the first 10 years. I would never have dreamed, all that time ago, that what I do now would be possible.

Philip Foster is the vicar of St Matthew's Parish Church in Cambridge

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BBC Domesday Project: life in the UK charted on a video disc system driven by a BBC Master computer

Carol Atack looks at the ups and downs of Acorn, from the first BBC micro, to the new Replay system

A LEGEND IN THE MAKING

It's so easy to take your computer for granted these days. Just think how straightforward it is to produce superb documents with a few clicks of the mouse and a standard piece of word processing or DTP software. You can crunch numbers, sort data and print your document in 15 different fonts if you want to – all without much effort.

With all this taken for granted, it is easy to forget that when the current GCSE students were little more than babies, Acorn Computers was non-existent, and Risc OS, *Impression* and *Schema* were quite unimaginable goals. Few could have predicted the pace with which personal computers would develop.

If you were ever given the chance to see behind the closed doors of Acorn's research and development headquarters in Cambridge, you would see a collection of fantastic – and perhaps even home-made – podules on display, small circuit boards of old-fashioned design and components, often hand-made by wire wrapping. The team there maintains a sort of 'black museum' of past products and projects, and it shows the company's long-term commitment to innovation which has helped it to survive when virtually all the original competition has foundered. Some of the early chips and prototypes are also to be found at the headquarters of Arm Ltd, the company Acorn formed with Apple and VLSI.

Of course, the very first computers were mainframes and other large machines which were too expensive for individuals and usually needed their own air-conditioned rooms. However, the late seventies saw a huge growth of interest in computing, based on the idea that it was possible to produce a usable microcomputer

for personal use. Around the world, start-up companies began to offer primitive kits which allowed electronics enthusiasts to build their own computers.

Acorn was one such company, founded in 1979 by researcher Hermann Hauser and marketing specialist Chris Curry. Acorn's earliest model, the 1979 System 1, had 512 bytes of memory, and input was via a row of switches. It sold for £70 by mail order, but you had to build it yourself from the components supplied. However the trend was moving away from kits; Acorn's next project, the 4K Atom launched in 1980, was also sold in a ready-made form to satisfy those who could not solder.

The Atom was a great success in terms of the small market of electronics enthusiasts and hobbyists. But the computer bandwagon was gaining strength, and one of the prime movers turned out to be the BBC, which had decided to initiate a computer literacy project to bring home computing to a wider audience.

The BBC wanted to supply a home computer for the viewers of its planned literacy project and was already working with Newbury Laboratories on a planned machine, the Newbrain.

THE BBC CONNECTION

When Acorn co-founder Chris Curry discovered the BBC's plans, he persuaded the corporation to look at Acorn's development projects as a possible alternative to the Newbrain. The successor to the Atom, the Proton, was the start of the development process and just about matched the BBC's specification – on paper. No working model existed and Acorn's design team had to produce a working model within four days.

That this incredible feat was managed is the stuff of computing legend and in true fairy-tale style, Acorn won the BBC contract and was signed up to produce the 12,000 computers which the BBC expected to sell. In even more fairy-tale fashion, the demand following the 1982 launch far exceeded these initial expectations and Acorn expanded rapidly. 'It was the BBC micro that put Acorn on the map,' says Professor Steve Furber, who co-designed it with Roger Wilson.

But rapid growth created its own problems. Some early Acorn staff eventually became disillusioned and left as the company grew. Others, in tight-knit departments such as research and development, faced different problems. While the demand from the marketing side of the company was for more of the same, preferably cheaper, to capitalise on the home computer boom, the researchers were more interested in creating something new.

Developments of the original BBC micro were frequent in the following years. The first was the Electron, a cut-down and cheaper version, aimed squarely at the home market. It never had the hoped-for success and this was one of the first signs that all was not well.

To answer the researchers' desire to experiment with new technology, Hauser came up with the idea of the Tube, which allowed other processors to be added to the 6502-based BBC micro and thus to make new products. There were some resounding flops, such as the Acorn Business Computer, the company's first stab at business computing.

TROUBLED TIMES

By 1985 the problems were clear. Acorn was losing money following the failure of the Electron and ventures in the US and Germany. The company's shares were suspended until a solution was found, with Italian giant Olivetti paying £10.4 million for 49 percent of the company. However this proved insufficient to stabilise Acorn's affairs and a second round of financing took Olivetti's holding to 88 percent.

Meanwhile, spin-offs from the original BBC micro included the BBC+, which had a bit more Ram than the original, but was generally regarded as a stop-gap machine. The next significant upgrade of the BBC design, launched in 1986 and still sold today, was the Master series. Although retaining eight-bit technology, it had to face stiff competition from 16-bit machines made by other manufacturers. However it was sturdy, proven and had a strong base of software, and it consolidated Acorn's tightening grip on the education market.



Royal seal of approval: The Queen looks at a selection of BBC micros

Other Acorn machines from this period included: the Compact, a cheaper version of the Master; the Communicator, an oddity with a built-in modem; and the Cambridge Workstation, with a powerful second processor, but which sadly had limited interest among the academics it was aimed at.

To many outsiders, Acorn's future at this time looked bleak. However, insiders knew that a small team under Roger Wilson and Steve Furber was working on its most significant development – a family of reduced instruction set chips (Risc). At that time, Risc was unproven technology, but Acorn's researchers were keen to use it to produce Hauser's vision of an ideal office automation computer. Work had begun in massive secrecy in 1983, and working chips

THIRD PARTIES

Acorn's success is as much due to third-party development as it is to its own efforts. Developers from the early BBC days are still around, continuing development for the newer Acorn machines.

On the software side, companies such as Longman Logotron, Computer Concepts, Colton Software, Oak Solutions, Clares, and many more have made creative use of the Risc environment. Applications range from education, to graphics, to desktop publishing, to games. The Archimedes' advanced graphics capabilities have made it an ideal platform for the latter, and a myriad of new adventures are creating a growing wave of enthusiasm for Acorn machines.

Third-party hardware add-ons have played a crucial part in the BBC micro's success, especially in education. The user port allowed a wide range of devices to be attached to the micro. Examples include The Music 5000 System from Hybrid, which continues to encourage music making on the Beeb. And the Concept Keyboard helps to bring the benefits of BBC and Archimedes computing to those with special needs.

With the launch of the Archimedes, add-ons instantly became more sophisticated. Early successes were Watford Electronics' Video Digitiser, which showed off the then incredible video facilities that the Archimedes offered. Numerous ingenious memory and storage upgrades got around the original A310's 1 Mb limit. And the four 'podule' slots were an irresistible challenge to developers.

Speed was a major factor in the Archimedes' initial success and go-faster upgrades were bound to be popular. Arm fans queued up to buy processor upgrades featuring Acorn's development of the Arm, the Arm3. Archimedes users also have access to faster laser printers more cheaply than users of other computers, because the Arm's power can be harnessed to directly driven laser printers. Computer Concepts and Calligraph share the honours here.

One product eagerly awaited since the launch of the Archimedes is a PC hardware expansion card, soon to be seen in the form of the 386 PC Expansion Card from Aleph One.

WHERE ARE THEY NOW?

Hermann Hauser, the co-founder of Acorn computers is currently chairman of EO Computer Europe. Chris Curry, the other founding member, has moved on from personal computers and is now involved in satellite and cable television and communications at Cambridge Cable. Steve Furber, co-designer of the BBC micro has moved into the academic world and is now the ICL Professor of Computer Engineering at Manchester University. His current research involves designing an asynchronous version of the Arm chip, which will run as fast as its construction allows and will not be tied to a particular clock speed. One member of the early Acorn team, who is still very active there, is software and systems guru, Roger Wilson. He joined in the early days to help develop the Atom and is still firmly at the helm of research and development, as well as acting as a consultant to Arm Ltd. His recent work includes Acorn Replay and the continuing development of the operating system, Risc OS 3.



Key players in the BBC micro story. Left to right: Hermann Hauser, Acorn co-founder; John Radcliffe, executive producer of the computer literacy project; Chris Curry, Acorn co-founder; David Allen, project editor; Professor Steve Furber, co-designer of the BBC micro

existed by 1985. Amazingly, Olivetti bought Acorn, apparently unaware of the development project. The challenge was then to turn the chips into a computer.

The office automation plans, including a new operating system called ARX, developed more slowly than expected. Even Roger Wilson described the project as 'a black hole'. A second plan was quickly developed to use the Risc chip-set in a micro which could be positioned as the successor to the BBC. Thus the Archimedes was born in late 1987, before its operating system, known as Arthur, was completed.

Arthur was developed from the Master's operating system, with a token nod to graphical user interfaces. The Archimedes quickly became controversial. Other manufacturers were displeased about its 'BBC micro' tag, while potential users were concerned about the Risc technology and the lack of software. It soon became apparent that Arthur was unacceptably bug-ridden and Acorn reacted to this by pouring resources into upgrading and improving it.

The original machines sold slowly but steadily as more software became available. Some companies, including Computer Concepts, even put effort into designing their own operating systems, such was the level of despair inspired by Arthur. Meanwhile, Acorn also started work on another operating system, implementing its own version of Unix, for a version of the Archimedes.

CALCULATED RISC

The launch of the new operating system, Risc OS, in 1988 turned the Archimedes around, providing a graphical user interface and multitasking which is infinitely superior to rivals such as Apple's Finder and Microsoft's Windows 3.0. At last, software developers had a sound base from which to create applications, and exciting new programs were announced in almost every issue of *BBC Acorn User*.

Two series of Risc OS machines had been launched and Acorn continued to refine the original Archimedes concept, adding new features and improving others such as memory, storage and price.

Then came the new BBC micro, the A3000. Launched in 1989 at the *BBC Acorn User* Show, it has proved tremendously successful with both schools and individuals.

Development work continued on the Arm2 chip featured in the Archimedes/A3000, and the more powerful Arm3 chip was announced in 1989. It was first used in the A540 and R200 series the following year.

Acorn's original plan was always to make the Arm chip available to other manufacturers. Apple started evaluating the Arm in 1988 and by 1990 had reached a decision on the chips; the company was definitely interested and, although it has yet to announce formal plans for the product, many people anticipate an Arm-based pocket computer with an Apple badge.

The formation of a company including Acorn, Apple, and VSLI – called Arm Ltd – is probably one of the most significant events in Acorn's history. Although the Arm chip has been highly successful, and is one of the world's best-selling Risc designs, it needed another big name behind it to give it more credibility – and Apple's investment gave it that, plus the power to speed further developments of the chip.

It is quite possible that Arm-based systems from Apple and Acorn will be selling alongside each other. 'In some ways we have a lot in common with Apple,' says Acorn design guru Roger Wilson. 'There is a similar atmosphere in the labs of both companies which you don't find at IBM or DEC. And both companies are committed to being different, and believe that their technology is the best. Perhaps that's why Apple were so keen to invest in Arm.'

Acorn continues to maintain itself with a reasonable degree of success. New machines are eagerly greeted by users; customers queued to buy the Arm3-based A5000 model with Risc OS 3 operating system at last year's *BBC Acorn User* Show. Acorn's domination of the UK education market seems assured, with rumours of new, even more competitively-priced Archimedes models and the long awaited portable. Acorn can still come up with world-class technology, such as the multimedia engine Acorn Replay developed over the last couple of years by Roger Wilson and his team.

Those crazy early days may never return, but Acorn has earned itself a respected place in the market: its reputation for quality, advanced technology and commitment to customers will ensure its place in computer history. The next ten years should be just as interesting.

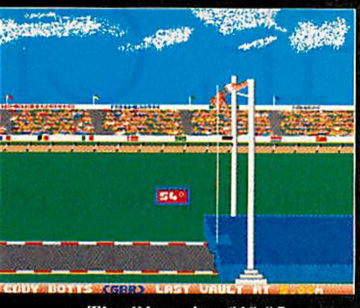
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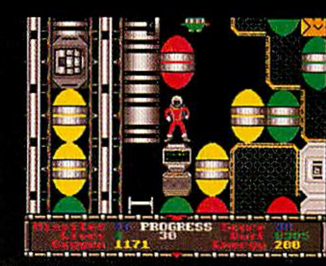

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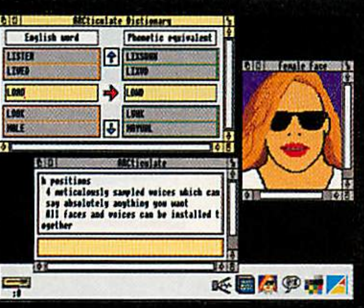

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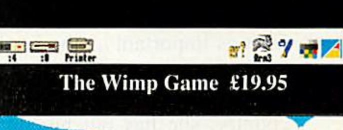
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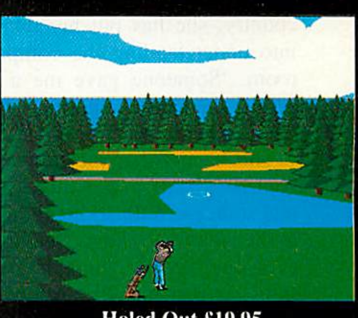
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TOP OF THE CLASS

Ten years of the BBC Micro has changed the face of education.

Carol Atack looks behind the gates of two Cambridge schools

ST ANDREW'S JUNIOR SCHOOL

At St Andrew's C of E Community Junior School in Chesterton, Cambridge, both BBC and Archimedes machines are used throughout the school, and the teachers are convinced that they have had a profound effect on learning.

Micros were introduced to primary schools in smaller numbers than at the secondary level, and in the early days of the BBC micro, the typical set-up was one computer per school. Although the computer was a welcome resource, it simply wasn't accessible enough to the teachers or the pupils. The computer would be wheeled around from classroom to classroom on its trolley, so you would have it for one afternoon a week. 'That made it impossible to make it an integral part of your lessons,' said St Andrew's IT (information technology) co-ordinator, Veronica Woods.

Her early IT experience was in central London schools where Research Machines' 380Z and Nimbus held sway. Now she has a BBC A3000 and a colour printer in her classroom, where it is always available to her class of seven and eight year olds and can be integrated into the lessons.

The advent of the Archimedes, and especially Risc OS, was as important as the arrival of more computers to the school. Teachers at St Andrew's praise them for their ease of use compared with the older machines.

Resources to support the computer became at least as important as the hardware itself. Woods admits to having very little formal IT training, but, like a great many teachers across the country, she has put her own time and money into understanding the computers in her classroom. 'Someone gave me a Beeb, which was great,' she said. Acquiring her own Archimedes allowed her to practice programming skills.

The Cambridge location has enabled the St Andrew's staff to get more support from informal sources. With so many high-tech businesses in the area (the famous Science Park is close by) everyone knows someone with programming skills, or that bit of extra understanding needed to troubleshoot thorny problems. Beyond that, IT expertise in the school is largely self-supporting, with the teachers sharing their knowledge. Woods recently ran a *Logo* workshop to refresh the staff's understanding of control technology.

A wide range of software is used within the school. Adventure games and simulation software are particularly prized for project work and subject teaching, but general application software which can be used across the curriculum is even more useful. The junior word processor, *Pendown*, is used by younger pupils.



The BBC A3000 is planned into lessons for seven and eight year olds

WELCOME!

Computers are even used to welcome new pupils to St Andrews. With 280 pupils, the school can seem quite daunting to seven year olds, who have come from small primary schools, so Veronica Woods wrote an adventure game on the BBC A3000 to introduce the year's intake to the school and get them used to micros at the same time.

'The new pupils had to travel around the school in the game, meet teachers and find four hidden objects. The objects included a flower bulb and a trowel and when children completed the game, they were given a real bulb to plant in our nature area,' she explained. The game was a huge success, but that doesn't surprise Woods.

'If there's one object in the classroom which is guaranteed to excite children's interest, it's the computer.'

Many teachers will tell you that word processing is a surprisingly liberating experience for young school pupils. Woods concurs: 'It allows them to draft and redraft, to correct mistakes easily and to produce a neat print-out of their story.' For children who find writing physically difficult, or who want to make changes to the content of their work without destroying the presentation, word processing offers many opportunities. It improves their confidence and self esteem no end,' said Woods.

She adds a Concept Keyboard to the computer to enable children with special needs to word process. With the help of the appropriate overlay, a child who might find it hard to enter separate letters correctly can create a story by picking whole words from the keyboard overlay. The advent of classroom computers has been particularly important to special needs students who for once are not at a disadvantage.

The BBC micro with its wide range of software and peripherals has proved particularly important in allowing students with physical disabilities or learning difficulties to reach their full potential. The staff at St Andrew's are very aware of this benefit: 'We have a large number of children here who for various reasons are classified as special needs,' said headmistress Chris Evans. She firmly believes that the arrival

of classroom computers has changed the outlook for these pupils, who are fully integrated into the mainstream life of the school. Anyone who has seen a child's pride in work that is freshly printed, in beautifully even letters, will know what she means.

Only a few years ago teachers hand-wrote worksheets and duplicated them on old-fashioned equipment. Now the students themselves can produce quite sophisticated documents, whether they are essays, stories, school magazines or even interactive multimedia presentations. Carefully produced software and add-ons help children with special needs to play a greater part in integrated classes.

But it is not just the computers, but the enthusiastic response they generate among both staff and pupils, that has really made the difference. Ten years of the BBC micro has changed junior education in many ways. Computers are now the most powerful tools available in the classroom. Although other technologies, such as television and video, are also important, the computer with the right software and peripherals is the students' vital link with the future outside the classroom.

NETHERHALL SENIOR SCHOOL

In the computer room a dozen GCSE information technology students are busy working on their projects. Several have been studying the use of computers in the community and are typing up their reports. Their handwritten notes are transformed into professional looking documents with the help of *Impression* desktop publishing software.

Actually, one pupil is using *View* because he thinks it is easier to use. Another boy is cleaning up a scan of some business card artwork which will later be printed as part of a Young Enterprise project. And another pupil is having a disagreement with a printer which is refusing to produce the output he wants.

This is a typical picture of IT activity at secondary level, but at Netherhall School in Cambridge it doesn't stop there. The computer room is one of four well-equipped classrooms which provide centralised facilities for whole classes to use. But most general classrooms and labs contain at least one computer, for general use or for a subject-specific task.

Electronic mail services link the school to information databases and to schools in Hong Kong and Germany. Even the school's prospectus was designed and desktop published by a sixth former as an A level project.

Head of IT, Alastair Wells, reckons that 90 percent of staff at the school use computers in their lessons, and that it would be highly unusual for a pupil to leave without a good grounding in IT. Their understanding of the rest of curriculum is also enhanced by the use of technology.

Not every school has over 100 computers, and not every school has spawned its own software publishing company. But looking closely at many of Netherhall's computers it becomes clear that the level of computer provision was developed over some time. It has taken ten years of determination to get to the current happy state. 'We are in the upper echelons when it comes to IT', said Wells proudly, 'but it has taken a lot of commitment and a positive attitude to funding.'

Back in 1982, he and a handful of colleagues introduced some of the first BBC micros to the school. At that time computers were the province of the maths department, occasionally of a computer science specialist. The Netherhall teachers wanted to integrate this exciting new resource into the whole curriculum. If the software did not exist, they wrote it themselves, gaining valuable experience and skills. None of them were computer experts and some were, by their own admission, complete amateurs when it came to computing.

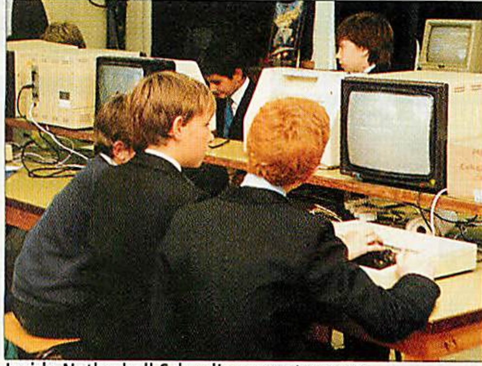
'It was so user-friendly I just got hooked,' said Brian Gillander, who is now the school's network manager. The BBC micros were first used in geography, physics and biology. Educational software at that stage usually took the form of simulations, which mimicked real events and processes, and computer-assisted learning (CAL) packages which usually took a question-and-answer format.

Many subject-specific programs are still used in the school's teaching, including some which were written a surprisingly long time ago. If a program or peripheral continues to deliver the results, the school sees little point in replacing it. GCSE biology students, for example, carry out all their project work using a BBC B and a data logger which looks distinctly battered but comes up with the results every time.

For schools who usually need to watch their resources, the BBC micro has proved to be a sound investment. 'We still have the original machines, and we're still buying BBC Bs secondhand', said Wells. 'I've cannibalised a couple for spares and most have been upgraded to use 3.5 in discs which can be swapped with the Archimedes more easily.'

Pupils are able to use the same software throughout their education. As 11 year olds they are introduced to the *Key* database (if they haven't already encountered it at primary school) on the BBC micro, and continue to use it on Masters, Compacts and A3000s as they progress through the school. This continuity allows pupils to concentrate on finding and using the information they need, rather than go through the process of relearning the technology, say the staff at Netherhall.

'I have looked at other systems,' said Wells, 'but the Archimedes offers the power and the software that the school needs.'


Inside Netherhall School's computer room

MULTIMEDIA

Netherhall School is at the forefront of the development of multimedia projects, most notably The Battle of the Somme, which will be on sale from Easter this year.

The Battle of the Somme combines a vast selection of resources documenting this stage of the 1914 – 1919 war and sets it into a wider context. The Imperial War Museum provided many of these documents along with a great deal of support and Oak Solutions also supported the project, which is based on its Genesis multimedia authoring package.

Students studying the period can read letters from the trenches, find out when and where the battle happened using the calendar and maps, listen to the songs which soldiers would have sung and even watch film of the battle and life in the trenches. Still photos and sound recordings of interviews with the survivors provide another dimension. In addition, there is a text-based library of further information. Information is cross-referenced so



that pupils can find all the information on a particular subject quite easily, or obtain more details on unfamiliar words or concepts.

The program is aimed at use across the curriculum in history, music, maths, English and art, and includes supporting materials to help teachers. Local interest can be added by creating a database of soldiers from the local regiment, and their involvement in the battle.

More details on The Battle of the Somme are available from Netherhall School on (0223) 242931.



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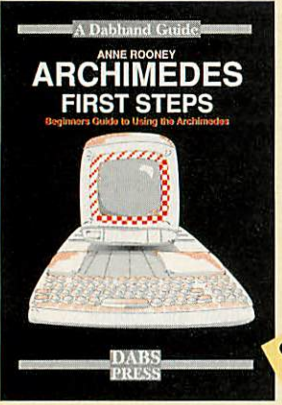
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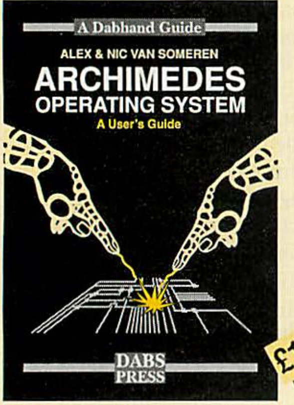
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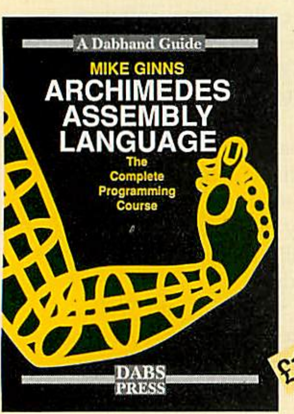
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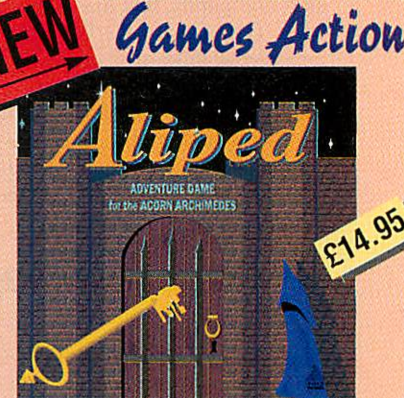
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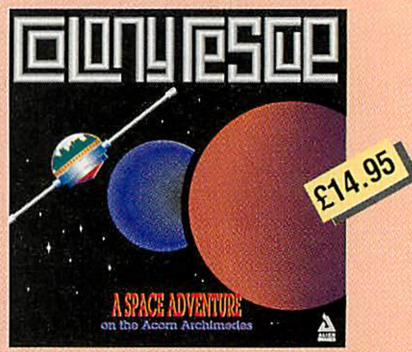
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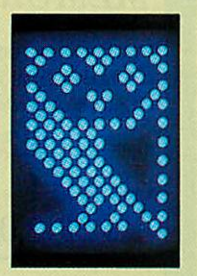
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FAMILY TREE

Our at-a-glance guide to key Acorn developments of the last 10 years

1982

The BBC made its debut on *The Computer Programme*. Sales were expected to be around 12,000, but orders for double that number were taken. Models A and B cost £235 and £335 respectively.



1983

The Electron was Acorn's attempt to crack the mass market and was essentially a scaled-down version of the model B. It lacked teletext display, although several interfaces were added later.



Electron set for battle at £199

Subscribers vouchers in next issue

1984

Acorn decided to venture into the business market with the Acorn Business Machine. The ABC range had four models. Each had a 'three box' design and were repackaged BBC micros.



NEWS

New Acorn micro

1985

The Olivetti Group eventually took a controlling share of Acorn. The company launched the Cambridge Workstation, aimed at the research and further education market. It offered 32-bit processing.



NEWS

Olivetti sort out Acorn

1986

Acorn launched the Master 128, which is still available today, and the Master Compact. The BBC launched its Domesday System, with facts about life in modern Britain on laser disc.



1987

The new Arm-based Archimedes with 32-bit Risc technology was launched. The original Arthur operating system was soon replaced by Risc OS. The BBC badge was included, but dropped later.



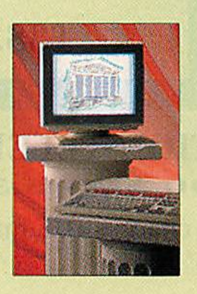
1988

The R140 Unix workstation, Acorn's most up-market micro to date, was launched, costing over £4,000. In the same year, the 200,000th Master series computer was sold.



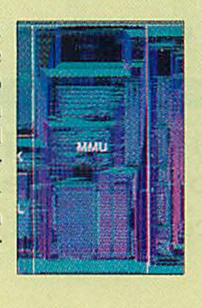
1989

The current BBC micro, the A3000, was announced, featuring 32-bit Risc processing. It was a classic update of the original BBC micro design and is the biggest selling machine in education.



1990

The R200 series Unix workstations were launched. Acorn also formed Arm Ltd with partners Apple and VLSI to further develop chip technology. The 100,000th Arm-based computer was sold.



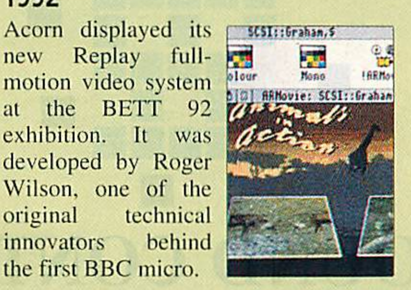
1991

The A5000 was launched at the *BBC Acorn User* Show. Aimed firmly at the PC market, it features an upgraded operating system, Risc OS 3, a faster Arm3 chip, and new multiscan monitor.



1992

Acorn displayed its new Replay full-motion video system at the BETT 92 exhibition. It was developed by Roger Wilson, one of the original technical innovators behind the first BBC micro.

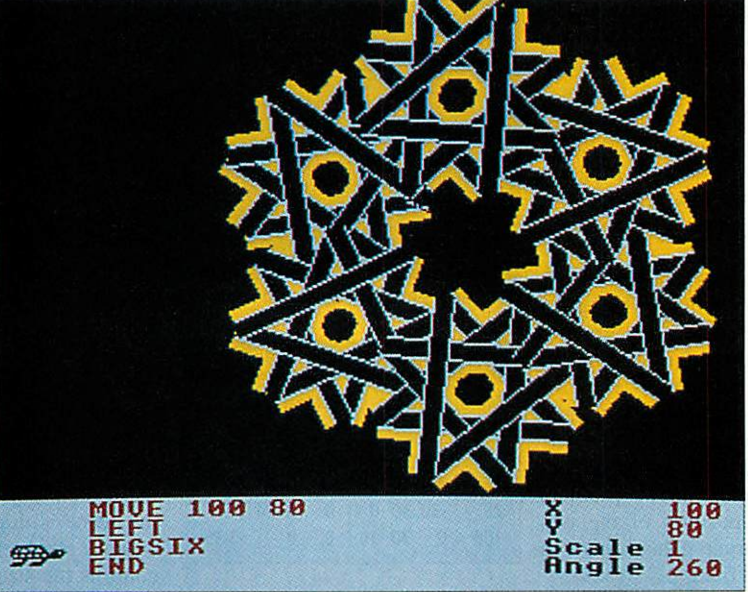


1993



COLLECTOR'S ITEM

Dave Lawrence looks through the vaults and comes up with four educational classics for the Beeb



Turtle graphics make computer programming into child's play

This month we set out a special mission for our regular contributor Dave Lawrence. We asked him to rifle through the vaults and come up with four classic *BAU* programs written for the BBC micro, that are as applicable to education today as when they were first written. And this was no trifling matter, since there are numerous examples to choose from but, never one to resist a challenge, Dave made straight for the *BAU* dungeons. And here is what he dug up...

TURTLE GRAPHICS

Seven years ago, in February 85, to be precise, **Malcolm Banthorpe** presented one of the few 'true' educational pieces that I could find in my rummagings, *Turtle Graphics*. I actually ended up rewriting it, keeping the style of the original as much as possible. Sadly, my efforts are rather too long to fit on an un-expanded Beeb, so you will need shadow Ram, a second processor or a Master. (For those interested, Malcolm's original, untidied program is on the subscribers' disc and this runs on all eight-bit machines.)

Anyway, on to the program. *Turtle Graphics* is a part of the highly acclaimed educational programming language *Logo*. The program can understand very simple turtle commands that allow geometric shapes to be described and drawn on the screen by simply giving the turtle moving instructions.

But, let's start from the basics. When run, a small arrow appears in the centre of the screen. This represents our turtle and at the start it is facing upwards. The turtle is given instructions to move forwards, turn to the left and so on by typing in simple commands. A typical command would be FORWARDS or BACKWARDS followed by a distance, such as 100. It can also turn LEFT or RIGHT by a number of degrees, so if you wanted the turtle to draw out a square you could type:

```
FORWARD 100 RIGHT 90
FORWARD 100 RIGHT 90
FORWARD 100 RIGHT 90
FORWARD 100 RIGHT 90
```

This would get very long winded if you wanted a shape with lots of sides, so a loop command is provided. To start a loop, you use REPEAT followed by the number of times you want the loop executed. You then enter the core of the loop and finish it off with the keyword AGAIN. A square would therefore become:

```
REPEAT 4
FORWARD 100 RIGHT 90
AGAIN
```

Note that in Malcolm's original, you can not nest loops, although in my version you can nest up to ten loops within each other.

To change the colour of the lines drawn, use PENCOLOUR. Mode 1 is used, so it may be followed by 0, 1, 2 or 3. If you wish to change the default colour scheme (black, red, blue, white) you can use SETCOLOUR. By default, all lines drawn are thin. If you'd like thick lines, then use FATLINES followed by a width. THINLINES or FATLINES 0 will put you back to thin lines. Thick lines can have an extra outline colour, specified by OUTLINE. OUTLINE 0 on Malcolm's, or OUTLINE -1 on mine, will disable this – note that you cannot outline in black on Malcolm's.

The scale of the drawing can also be altered, SETSCALE explicitly sets the 'multiplier' on all line lengths, SCALE affects the current value (the default is 1). On Malcolm's program, you can enter any value, such as 1.5, 4/3, 1 and so on. On mine you must enter two numbers, first the zoom factor, second the shrink factor – you could think of these simply as the top and bottom of a fraction, thus SETSCALE 2 1 will set the scale to 2, SCALE 3 4 will scale by three quarters.

PENDOWN and PENUP controls whether a line is actually drawn or not and MOVE allows you to move to a screen co-ordinate.

To store a definition, you must first give it a name with the TO keyword, followed by the name. You then type in the definition, and it will be drawn as you go. The definition should finish with END. An important variation within Malcolm's version is that it cannot draw out a REPEAT loop as it is typed in. If you want to use them, you have to wait until a program is completely defined to see it in action.

If you now type CLEAR to reset the program, then type in the name of your shape it will be drawn in full. Definitions can be displayed by LIST-ing them and removed by FORGET-ting them. LIST by itself in my version will display all the user defined functions. I also list my functions with REPEAT loops indented. Due to lack of

LOGO EXAMPLE

The following Logo programs produced the pattern above.

```
TO STAR
REPEAT 8
FORWARD 300 RIGHT 135
AGAIN
END

TO SIX
REPEAT 6
STAR
PENUP LEFT 60
FORWARD 100
PENDOWN
AGAIN
END

TO BIGSIX
FATLINES 16
PENCOLOUR 2
OUTLINE 0 SIX
PENCOLOUR 0
OUTLINE 3
FATLINES 8 SIX
END

TO PATTERN
CLEAR
MOVE 100 80 LEFT 4
BIGSIX
END
```

memory in both versions, there are no editing functions. Both do, however, support saving and loading with SAVE and LOAD followed by a filename. Note that a different format is used by each program. The figure on the previous page shows four example definitions. If you type them all in and then type PATTERN, you will soon see the possibilities.

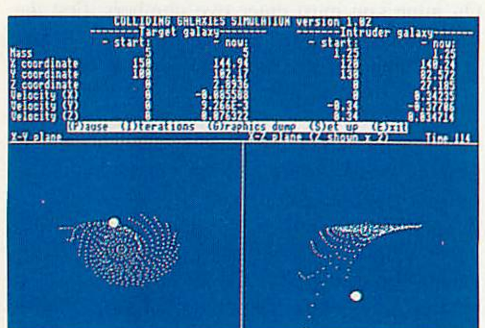
CLOSE ENCOUNTERS

The cover feature of *BAU* July 89 dealt with colliding galaxies, and **Andrew Rankin's** program allowed you to set up your own. His program creates a nice stable galaxy and then throws another one at it. With careful tweaking of the input parameters and a lot of patience, you can see how all manner of star formations may arise from a simple disc galaxy. Due to the sheer bulk of data to process, Andrew's program will need a similar setup to the one described for the turtle graphics – in other words, no basic Beebs allowed.

In the simulation, all forces except gravity are excluded. The stars move under the influence of the two central cores and trace out the gravitational field of the combined system. The model consists of a target galaxy, made up of a disc of stars in circular orbits round a central core, and the passing intruder is represented only by its nucleus. The target is 15,000 parsecs wide and contains 100 billion star masses. The problem reduces to calculating the position of the two galactic centres and the target galaxy stars in their combined gravitational field.

When running the simulator, keep the numbers of stars down (say four rings of ten). You can increase this when you find an interesting scenario. For position and velocity, try X=7.5, Y=0, Z=35, x=0, y=0, z=-1 to start with. Obviously you should adjust these as you see fit.

The computer will calculate the motion of the tracer stars and galactic centres and display top and side views of the collision. During the run, a number of options keys are displayed on the screen; the function of these should be fairly self-explanatory. The figure on the right gives some example parameters to try.

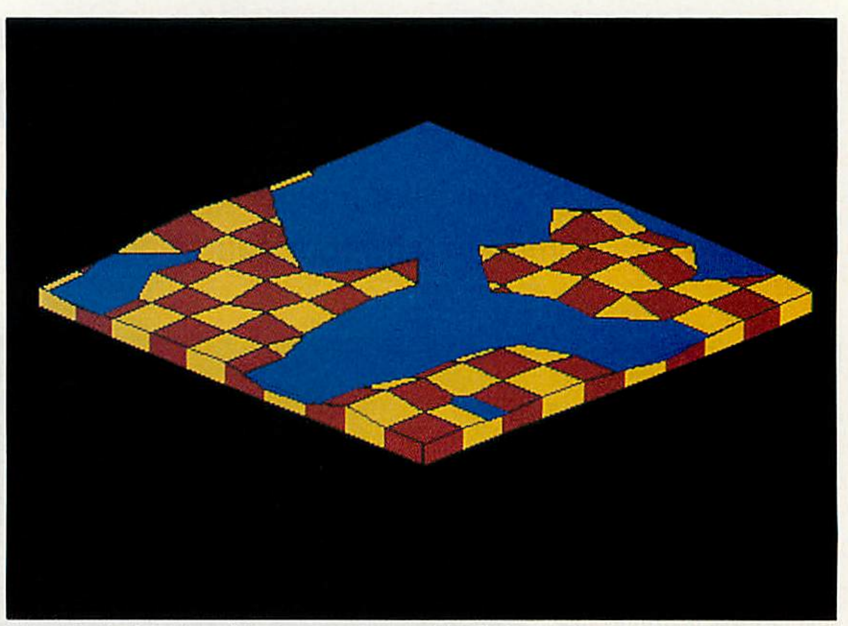


Close encounters in outer space

DOWN TO EARTH

Two months after Andrew's galactic simulator, we featured my very own earth simulator, showing how a flat plain could be distorted with a number of geological faults to produce a mountainous terrain.

That issue contained two versions of the program – a high resolution, colour-schemed one for the Archimedes only and a simplified


The earth simulator is used to show how geographical faults can change a landscape

EXAMPLE GALAXY DATA

Mass (%)	Position x	y	z	Velocity x	y	z
100	7.5	0	35	0	0	-1
25	40	10	10	-1	0	0
25	-30	30	0	0	-0.34	0.34
100	0	30	10	0	0	-0.35

chequer board one for the BBC. The latter is found in the yellow pages and we have put the Archimedes version on to the subscriber's monthly disc.

During the first stage, a counter is displayed to indicate how many faults are left to add. Then the screen is cleared and an isometric view of the scene is drawn. A number of parameters in PROCinit can be altered to vary the display; size% controls the size of the array and xscale%, yscale%, zscale% control the size of the plotting. The faults are the number of times the landscape is faulted and linear and circular are two flags that describe what sorts of faults these will be.

After the scene is calculated, the highest and lowest points are found. These are then used to calculate the water level. You could vary this, if you wanted to produce a more aquatic scene.

WHEN IN ROME

Finally this month is **Michael Leete's** Roman number calculator from *BAU* June 90. It could be used in history lessons and performs several functions. Firstly, it can convert Roman numerals into Arabic and vice versa, secondly it displays the calendar and day of the week in Roman form for any date ranging from 1 January 1AD to 13 December 9999.

Finally, it demonstrates how addition is performed with Roman numerals. The program provides a menu and help system, so I won't waste any space here describing how it works. Michael's original article provides lots of interesting background material on the origins of numbers and calendars – well worth a read if you get the chance.

YELLOW PAGES

All of the programs in this article can be found in this month's yellow pages. Instructions for typing in the programs are on page 85.
The programs can also be obtained from the monthly disc which is free to BBC Acorn User subscribers. For more information on how to obtain a subscription, please turn to page 29.

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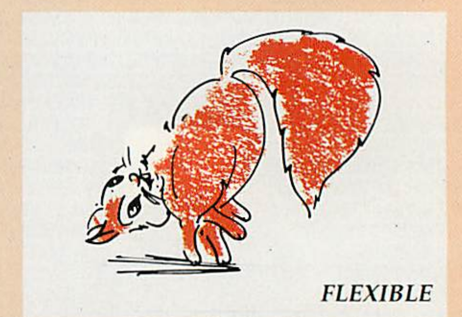
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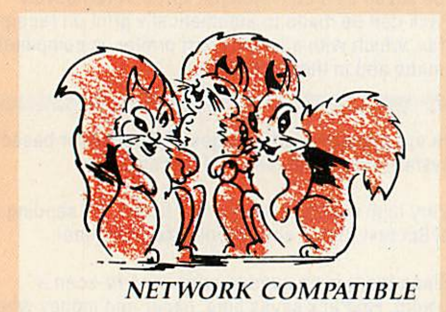
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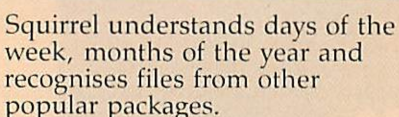


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COMPATIBILITY KEY

- B BBC B compatible
- B+ BBC B+ compatible
- M Master compatible
- C Master Compact compatible
- E Electron compatible
- A Archimedes compatible
- BBC A3000/A5000 compatible

★PRIZE £40★

FEELING THE SQUEEZE

Give an Archimedes owner a new state-of-the-art, slim-line 100Mb, 16ms, cached, fully-hyphenated drive and what do they do with it? Fill it with soundtrackers, Giff pictures and *StarTrek* samples, of course. No wonder that data squashing programs, such as *ArcFS* and *Compression,* have proved themselves so popular.

A5000 owners may have noticed that Risc OS 3 has a module called *Squash* and there is a *Squash* application supplied on the Apps disc.

This behaves a bit like a poor man's *Compression*. It allows you to compress and expand your data but does not work transparently as *Compression* does. What this means is that you cannot directly load a squashed file, you must unsquash it first. Also you can only use *Squash* on a complete file, rather than saving it into squashed format as you go along. Luckily, the *Squash* module does provide two SWIs that can allow access to the built-in compression routines.

With a little thought, these missing functions can be written and used within other programs. We've received a module from **Brian Cooke** that allows squashed files to be examined and loaded, cutting out the unsquashing stage. (A squash saving routine is also on the way.) The Squash module has one SWI for compression and one for decompression. Both take and return six parameters. They have been coded to provide maximum versatility – there is no need to hold the entire input or output data in memory. Instead in and out buffers can be supplied. I won't go into the full details of the calls as they are quite complicated. However **Brian Cooke** has supplied a demo, to show how the module works and this is as follows.

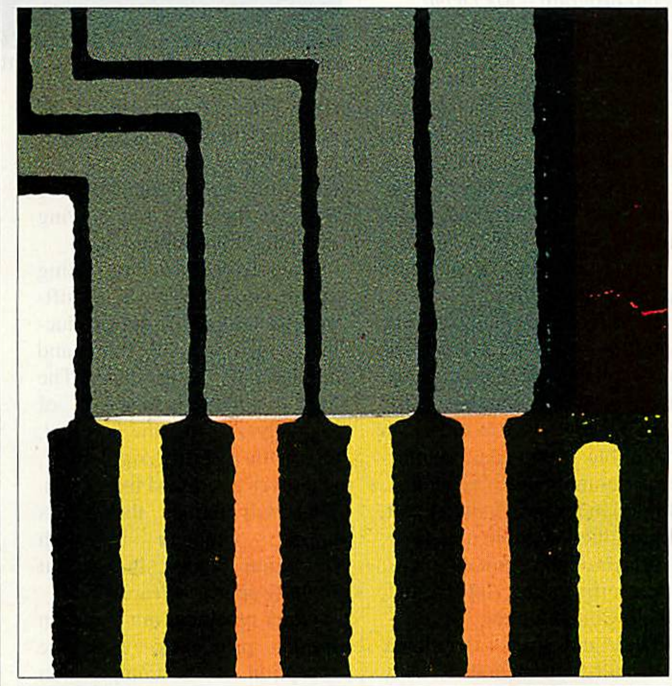
```
Header Code for File

Byte    Contents
  0     'SQSH'  (header)
  4     original length
  8     load address
 12     exec address
 16     reserved (all 0s)
 20..   actual data...
```

Squashed files have type &FCA and consist of a short header (as shown in the table above) plus the data. The initial call made to Squash_Decompress finds out how much workspace the SWI needs, hence bit three of R0 is set. The size of the input buffer is input_size, and tells us how many bytes we will be reading from the input file at a time. The variable output points to where the next lot of data is decompressed to; end is the calculated address of the end of the expanded file, unused is how many bytes are in the input buffer already and start is set to zero, meaning we are starting a new operation.

At line 290, we read as many bytes as we can into the input buffer (taking into account how many are already there). Then not_got returns the number that were not read, and so bytes can be calculated as the number of bytes now in the buffer. The main call to decompress is quite long, R0 contains flags; bits 2 and 3 are 0, bit 1 is set when there is more data after the current call, and bit 0 is set if we are continuing an operation.

The register R1 points to the SWI's internal workspace, R2 points to the input buffer and R3 contains the number of bytes. Similarly, R4 and R5



✱INFO COMPATIBILITY TABLE

LISTING	NAME	BBC B	MASTER	ELECTRON	ARC
Info 1(a)	SquashS				✱
Info 2(a)	SquashDemo				✱
Info 3	MFSrc	✱	✱	✱	
Info 4	MFDemo	✱	✱	✱	
Info 5	Pattern				✱
Info 6	Maze				✱
Info 7	Worms				✱
Info 8	3DWave				✱
Info 9	InputLib	✱	✱	✱	
Info 10	InputDemo	✱	✱	✱	
Info 11	TrigProg				✱
Info 12	Blancmange	✱	✱	✱	✱
Info 13	Waves	✱	✱	✱	✱
Info 14	MakeSp				✱
Info 15	!RunImage				✱
Info 16	Compile				✱
Info 15(b)	DivMc				✱
Info 15(c)	Life				✱
Info 19(c)	Prime				✱
Info 20(d)	DTSrc+				✱

(a) - Risc OS 3 only (ie: A5000)
(b) - Type into *Edit* and save the text file into the *sBasic* directory
(c) - Type into *Edit* and save as text for compilation using *sBasic*
(d) - Additions to last months *DTsrc* program

describe the output buffer. On exit, R0 contains a status byte, 0 if the decompression has finished. R4 is updated to point to the first unused byte in the output buffer, ready for the next call. The register R3 contains the number of unused bytes in the input buffer.

These must be resupplied to the call next time: the FOR...NEXT loop at lines 250-270 are used to copy them to the start of the buffer.

Then the call start is set to one to show that decompression has started. Note, the loop continues until a zero status is returned, at which point, the output buffer contains the decompressed file. It would also be possible to supply a small output buffer and write this to disc when full, so that an entire decompressor could operate in a surprisingly small amount of workspace. This would allow you to decompress far larger files.

The module simply contains the standard module header and a machine code version of the Basic loop.

```
Use of Registers

R0 1 (file)
R1 preserved
R2 load address
R3 exec address
R4 length
R5 attributes
R6 filetype(-1,untyped)
```

Two SWIs are provided in the program. The first is SYS "Squashed_Info","filename" and it returns R0-R6 as the output from OS_File 20. The other, SYS "Squashed_Load","filename", addr loads a squashed file at a given address. If addr is zero, then the file's own load address is used. Until Brian finishes Squashed_Save, you will have to continue to use *Squash* or the **Squash* command provided, to create squashed versions of your files.

★PRIZE £50★

FONTASIA

Clive Whiston earns himself £50 for this neat piece of programming. Many character redefinition routines have appeared in magazines before, but in our opinion, none have managed to achieve the readability of Clive's *MegaFont* program. Type in and run *MFSrce*, which will assemble the machine-code utility, check it for mistakes, and save the data as *MFCode*.

The *MegaFont* utility can then be called from Basic using the syntax: CALL (code+1),<string>, where code is the address where the utility was originally assembled (&900 by default) and the string variable contains the required text plus embedded control-codes. A better way of achieving output is the FNprint() function, issued from a PRINT statement and included in the demo program – *MFDemo*.

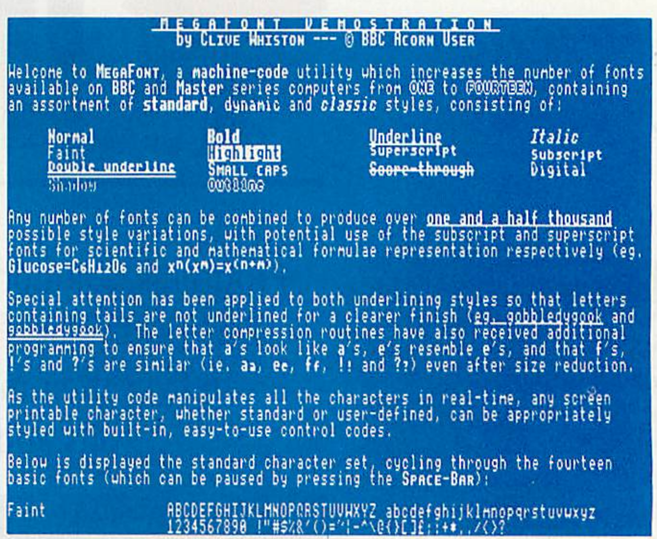
So how does the demo work? Firstly, the operating system stores eight by eight matrix bitmaps of the internal font in memory, which can be read with OSWORD 10. Combining AND, OR and EOR logical functions with left and right shift operators can re-define a separate character, in this case Ascii location 255.

In this way, many of the typeface variations can be accomplished. Rather than be stuck with the standard BBC font, *MegaFont* can create an incredible 1500 styles, via thirteen combinable typefaces: Bold, Underline, Italic, Faint, Highlighted, Double underline, Score-through, Small caps, Superscript, Subscript, Digital, Shadow and Outline.

The eighth line of the matrix is usually clear and is only used to display letters with tails. So by setting all of the bits in this byte, an underline effect can be achieved. Letters that do possess tails are ignored so that the tail is not obliterated.

To achieve highlighting, simply EOR each of the eight data locations with 255. This exchanges any bits which are set (displayed as a white dot), with any bits which are clear (not displayed), thus producing an inverse video effect.

The italic font is created by shifting the set bits, in the first two lines of the grid, by one bit to the left, whilst shifting to the right one bit, all the set bits contained in the last three data-locations. This produces a slanted effect. Unfortunately, as it is designed for modes zero or three, the italic gradient may appear over-slanted in 40-character modes, and even more so in modes two and five. This can be corrected by reducing the data shifts to one at the top and two at the bottom, or by shifting the last four lines to the right but leaving the initial four intact.



Fontasia: allows a myriad of fonts on the Beeb

Bold is produced by ORing the original matrix, and shifting itself to the right, producing wider vertical lines and emphasising the character. The faint typeface is a result of logically ANDing the original, also with a shifted right copy, and gives a reduced line width. This will reduce the letters impact, although in high resolution modes, the output actually appears clearer.

Other typefaces are based on similar principles, with the exception of the compression routine, which serves the superscript, subscript, double underline, small caps, and outline fonts. It re-arranges the character definition minus two lines, to reduce the vertical height. One side effect, is that it also reduces readability so there is additional programming giving separate treatment for letters such as f, !, ? and x.

The *MegaFont* utility is based around a loop, where characters are read from the string, supplied in the CALL statement, before being passed on to the font-handling procedures. Each font-handler checks if that particular style is required by reading the appropriate bit in the font flags (set by control-codes). If clear, the machine-code branches to the next font; if set, it formats the character held in the buffer to the desired typeface, then branches to the next handler. The last handler branches to a routine which stores the buffer definition into Ascii character 255, through the VDU 23 command, before displaying the newly formed letter.

If, however, the character read from the string was the control-code symbol (the vertical bar by default) the machine-code jumps to a interpreting procedure which reads the consecutive control-code from the string, and performs the appropriate task depending on its value, as summarised in the table below. Any font can be toggled on or off by including the correct control-codes in the string, which need not be nested. To format text in a particular style, include the control-code symbol and the

```
The Control Codes

B  Toggle bold
D  Toggle digital
F  Toggle faint (light)
H  Toggle highlight
(inverse colours)
I  Toggle italic
R  Toggle score-through
(crossed-out)
S  Toggle shadow
U  Toggle underline

+  Select superscript
(raised text)
-  Select subscript
(lowered text)
2  Select double
underline
C  Select small caps
O  Select outline

X  Change foreground
colour +"number"
Y  Change background
colour +"number"

.  Display a new line
|  Display control-code
symbol
N  Normal (reset all
flags + colours)
```

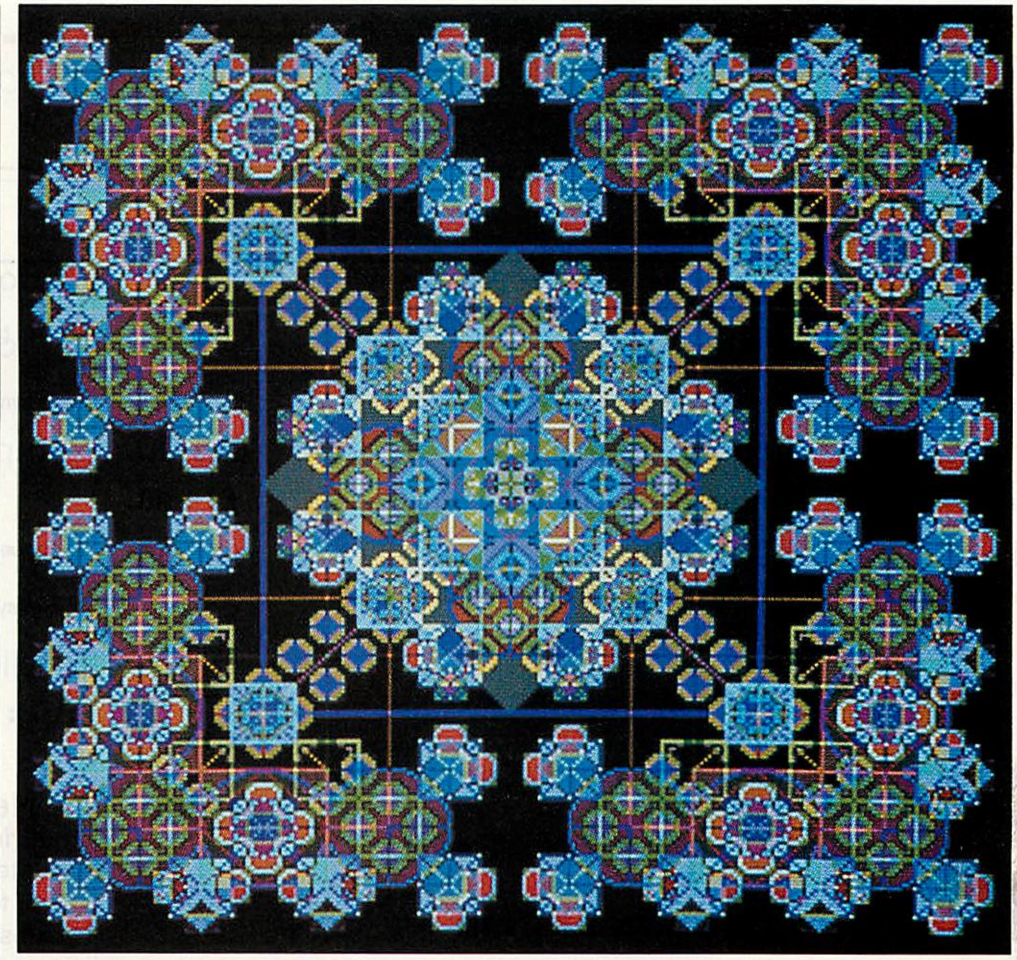
corresponding control-code in the string, prior to the characters. This is followed by either the same control-code again, to de-select the font, or by IN to reset all the flags.

As the compression routine is shared between five fonts, only one can be selected at a time, and the selection of one of these five over-rides the previous state. However, the remaining eight styles can be combined with each other and one of the compressed five.

The colour changing option requires two control-codes, the first to select the foreground or background (X or Y), and the second to select the actual colour (using textual numbers, Ascii characters 48 to 57). To display the control-code symbol, the character has to be entered twice in the string, even though it will only appear once on screen.

The machine-code assembles at memory location &900 by default, to avoid unnecessary occupation of user workspace, but this can be altered via the code variable in the source program and then reassemble. However, this does cause the code-checking routine to report an error, so the appropriate procedure call should be omitted.

As it is, the utility will overwrite various buffers (&900 to &AFF) and the user defined function key definitions (&B00 TO &BFF), so producing garbage when BREAK (function key 10) is pressed. Re-defining the function keys will corrupt some parts of the code, so it should be assembled at a different address if this is going to cause problems. This program could be taken still further. Perhaps someone would like to write a word processor, based around this utility?



Good Vibes: more patterned prettiness from our regular contributer, Jan Vibes

★PRIZE £20★

GOOD VIBES

A trio of programs from our regular contributor, **Jan Vibe**, should keep Arc users happy this month. *Pattern*, needs no explanation, other than it plots a series of random recursive patterns. They are produced on alternate screen banks, so you will need at least 160K of screen memory configured and the patterns will take a few seconds to appear.

The theme of recursion is continued with *Maze*. Most maze generators produce rectangular affairs, but this one is decidedly wiggly adding to its appeal. Paths are produced and wiggle about until they have nowhere to go. *Worms* is based on the same idea, combined with Jan's previous colour-sequence calculator (*BAU*, April 92). The result is quite bizarre and well worth the minimal typing required.



Good Vibes goes underground, with the psychedelic Worm program

★PRIZE £20★

3D WAVE

Jan Vlietinck is no stranger to this feature and this graphical example of his expertise seems to have taken a while to find its way to print. Sorry to Jan for hiding *3DWave* for so long – I'm sure our readers will deem it worth waiting for. The program displays waves passing over a square area. The area is made up of coloured dots, whose colours change depending on the wave height. Moving the pointer up and down creates the ripples. You may find the wave drifts off the screen if the pointer is held up or down for a while – move it the other way, to get the wave back.

INPUT LIBRARY

InputLib is a set of functions and procedures to simplify the inputting of strings and numbers in Basic. They are redesigned to run on eight-bit machines but will also work perfectly well on Arcs. Getting data into a program can be fiddly – checking that numbers are in the correct range, excluding certain illegal characters and so on, can make what was going to be a short program very long indeed.

InputLib is designed to improve this situation but before detailing how *InputLib*'s functions work and how they are used, new programmers may like to look more closely at the standard method of appending a library on to

your own program. You can use a utility like the *Basic Editor*, or simply type in the particular procedures required. Alternatively, spool out the library as a text file with:

```
LOAD "InputLib"
*SPOOL spl
LIST
*SPOOL
```

and then append it to your own program with:

```
LOAD "MyProg"
*EXEC spl
```

You must ensure that the line numbers of your library are different to those of your programs, to prevent overwriting and this is why *InputLib* has high line numbers (they run from 10,000 upwards). Try using this technique to add the library to the demonstration program *InpDemo*. This tries out all of the functions in turn.

PROCinp_init should be called once at the start of your program. This sets up a block of memory called inp_valid% which is used when checking the validity of certain characters during input. PROCinp_init also calls PROCinp_valid to set the default validation string.

```
Input Validation

@allow all characters

~disallow the
following character
~@disallow all (this is
the default)
^force characters into
upper case

\used as a prefix for
the special characters
above so they may be
included/excluded.
```

A validation string (often used on the Arc) is a list of characters, describing what key presses are allowed during input. *InputLib* validation strings may include any character but some have special meanings as shown in the table above. For example, the sequence "@~A~B~C" means allow all characters except A, B and C. "0123456789" means allow digits only and "@\^" means any characters except ^ will be permitted. Often you do not need to worry about validation strings, but they can be useful and most of the *InputLib* functions use them to prevent invalid input.

You may use the left and right cursor keys when editing any string or number entered. SHIFT and CTRL can be used with them. Also, DELETE and COPY remove characters left and right respectively. CTRL D deletes text from the current position to the end and CTRL U clears the whole input.

FNinp_string is the simplest function. It takes five parameters and returns the string typed. The parameters are: x position on screen, y position on screen, width of entry box, suggested answer and maximum length. Note that you can enter strings that are longer than screen space permits – a window is given of the specified length and text is scrolled within this. A suggested answer is provided and the user can just press RETURN to confirm the answer. For example, you might use this routine to enter a filename and then provide the old filename as an input suggestion.

FNinp_vstring is similar to FNinp_string but takes an extra parameter in the form of a validation string. Only valid characters are permitted and the suggested answer is also vetted according to the validation string. If no validation string is given, the default is used. You can set the default with PROCinp_valid.

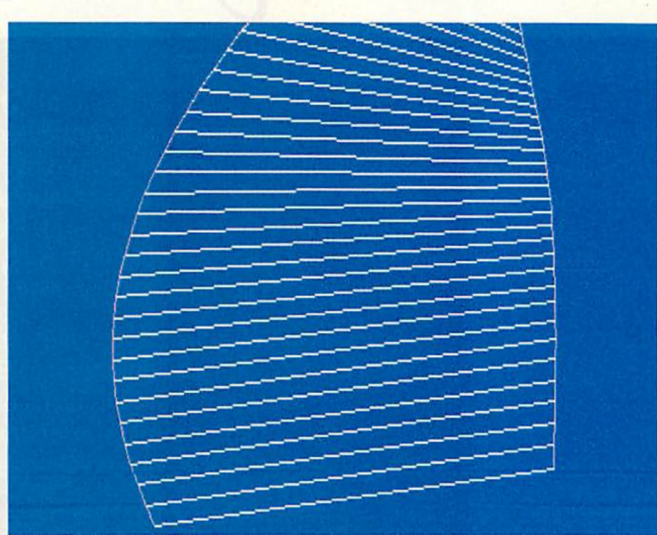
FNinp_int returns an integer. You must provide as parameters the x and y position and size of entry box (as before), the suggested answer as an integer (or zero for none) and the minimum and maximum values allowed as input. The user is repeatedly asked for a valid number that lies between min and max. If min>max then no check is made.

FNinp_hex is similar but returns a hexadecimal value – useful for entering addresses in memory or files. Only valid hex strings are permitted and the & that prefixes them cannot be deleted.

FNinp_float is similar again and returns a floating point number. It takes one extra parameter to the routines above – the number of valid decimal places. You'll not be able to type any more that this.

InputLib is an example of structured programming that makes full use of Basic procedures. FNinp_num and FNinp_hex both use FNinp_num which is a general purpose number-inputting function. All the functions eventually use FNinp_main which is the all-purpose input routine. By stacking procedures in this way, the finished program is not only shorter (important on eight-bit machines) but neater too.

FNinp_main takes eight parameters in all – the x and y position of the entry box, the size of the entry box, the suggested answer (if any), the maximum length, a validation string, a header string (used by FNinp_hex to provide the &) and the number of decimal places. The validation string is broken down by FNinp_main to form a table at inp_valid%. This table contains a bit for each character 0-255 which is set if the character is to be allowed. FNinp_valid reads these bits to check key presses. Note the use of INSTR to check for the special characters. If one is found, its code is converted to a special negative value and this is used to take the appropriate action. String operators are used extensively to manipulate the validation and other strings. One particularly useful technique takes the form, string$=MID$(string$,2), which simply removes the first character of a string.


Miniatures: more diminutive programs from the one-line brigade

MINIATURES

B B M C E A — Three one-liners here for lovers of such things. *TrigProg* is a remarkable 32-bit offering from **David** and **Andrew Jefferies** of Dorset. Particularly effective is the way the pattern bursts onto the screen. **James Grimmett** of Sutton Coldfield provides us with *Blancmange* which is a nice little fractal number. It runs on all machines, but faster on some than others. Finally, *Waves* is another all-machine one-liner from **Graham Hick**. Thanks to all the above and keep them coming.

OVER TO YOU...

B B M C E A — We're still reeling from the enormous response to our ✱INFO survey and we will be printing the findings soon. Your comments suggest that you all want more of absolutely everything – bit tricky that one. One particular area of interest is Basic procedures and many newcomers would like more detailed explanations. this is what stoked us into producing the *InputLib* routine. Watch out for more survey inspired changes in ✱INFO soon.

★PRIZE £40★

SIMPLE INTEREST

A — As regular contributor **Barry Wickett** has shown, writing a Basic compiler need not be too daunting a task. His invention, *sBasic* or simple Basic, allows simple Basic-like programs to be converted into Arm code. Typically, they run about eight times as fast as Basic V.

As *sBasic* is a Risc OS application, you will need to create a directory called *!sBasic* and place a number of files in it, found on the yellow pages. *!RunImage* is the Basic front-end, and *Compiler* is the program that does the work.

MakeSp should be run inside the *!sBasic* directory, as it creates the sprite file *!Sprites* and the necessary *!Run* file.

Finally, you will need to enter the text file *divmc* (using *Edit*), which is an Arm code division routine. If the program you compile uses division, this routine is part of the compiled output. As a final check list, you should have the following in your *!sBasic* directory: *!Run*, *!RunImage*, *Compile*, *divmc and !Sprites*.

A couple of standard examples, *Life* and *Prime*, are provided by Barry and you can probably guess what they do. These should be entered as text files. Double-click on the *sBasic* directory to install it on the icon bar and drag your program on to the icon.

Various compilation messages will appear, and any errors found are reported. If all goes well, the compiled output is then run. The figure on the right lists the commands available to you.

While *sBasic* only provides the bare bones of a language, it is surprising how versatile it is. The operators +, -, *, /, AND, OR, EOR and NOT can be used in expressions. Integers can be displayed and arrays are supported in a limited fashion. In fact, there is one built-in, single-dimension array, which can hold up to about 20,000 integers. This is used in both of our examples and is stored at the end of the compiled program to simplify memory allocation.

However, there are limitations to *sBasic*. It can only cope with integer arithmetic and just one loop structure is provided: WHILE ... ENDWHILE. No procedures or GOTOs (whoopee!) are allowed and PRINT is only provided in limited form. Also, if you use ORs or ANDs in logical combinations, as part of an IF statement, be sure to enclose your expression in brackets, as in our example *Life*.

ESCAPE cannot be pressed during execution and no error detection is performed. You will also have to be wary of divisions by zero (or include a

```
Commands Available In sBasic

IF <expression> THEN <statement>

IF <expression> THEN
 <statement>
      ...
      ...
 <statement>
ENDIF

WHILE <expression>
 <statement>
      ...
      ...
 <statement>
ENDWHILE

PRINT <expression> [;]

END         (must only be used at end of program - not
actually needed, but included for grammatical
correctness)

PLOT <expression>,<expression>,<expression>

VDU <expression>,[<expression>]...

<variable> = <expression>
              where <variable> is a single letter variable
name or
              ARRAY(<expression>)

<expression> is a combination of +, -, *, /, <, <=, =,
>=, >, (, ), AND, OR, EOR, NOT, <variable>

Note: All variables are integer only and divide is
equivalent to DIV.
```

check in *divmc*). As Barry points out, the real object of the compiler is to produce fast machine-code programs, without needing to write long routines to do simple things.

The output of the compiler is not machine-code itself, but a Basic program containing assembly language. This method simplifies matters, as the Basic assembler can take over part of the work. If your program ends successfully, type QUIT to return to the desktop. Or you can list it to look at the assembly language the compiler has produced.

We would, of course, be delighted to see any programs written in *sBasic* or any additions to the language that provide extra commands or faster compilation. We think that *sBasic* serves as a good example of how to write any type of compiler.

*UPDATE

Several readers have pointed out an error in the Weekday calculator, featured in the *A-Z of Beeb Programming* in our February issue. Apparently the calculator gets, confused by leap years, (as indeed do I). The correction is to change the year% at line 390 to (year%-1). **Jeff Gorman,** of Pontefract, also pointed out that Weekday was not really an accurate title, as the program also deals with week-end-days! Quite right Jeff, but I happened to be stuck for a W at the time.

Another update comes from **John Robinson** of Derby. Having enjoyed our Mr Lawrence's venture into module tasks, he has provided an update for the *DoubleTake* module. The lines to add or change can be found as *DTsrc+*. Now when a file is SHIFT double-clicked it is automatically loaded into *Edit*. Also, the help section has been modified so you can simply type *Help DoubleTake.

*DISC

Two extras are supplied on this month's subscribers' disc. The first is a desktop utility for Arc owners called *TidyDesk*, by **Mike Curnow**. It provides several new features for desktop users. Windows can be moved to the front or back and have their sizes minimised or maximised. They can also be tidied up, stacked or spread evenly across the screen.

As well as a wealth of other short-cuts and handy features, a screen-blanker is provided to prevent possible damage from leaving your monitor on too long. (The screenblanker actually uses a lissajous curve program to produce patterns on the screen.)

The other program on the subscribers' disc is another update to the *Mindmaster* game, originally in the *BAU* Jan 92 issue. **Ledger White** has written his own version and we thought it was too good to miss.

*QUIT

One very special thank you this month must go to *INFO contributor **Donna Parry**, the force behind the *Squiggle* one-liner. She became **Donna Acton** on the 28th February at Sunderland registry office.

Meanwhile, if you think that you have a program that would be of interest to your fellow readers, don't keep it to yourself. Send it to us at *INFO, *BBC Acorn User, Redwood Publishing, 20-26 Brunswick Place, London N1 6DJ.* All programs should be on disc, with a brief description of their purpose and operation. An SAE with your submission will ensure the return of your disc.

Dave Acton
Dave Lawrence

YELLOW PAGES

You can try out all of the programs listed here by typing them in from the yellow pages in the centre of the magazine. The instructions for typing in programs are given on the first page of the section.

Alternatively, subscribers to *BBC Acorn User* can simply load in the programs from their subscribers disc. They will also be able to try out two extra programs, *Desktidy* and a revision of the *BAU* Mastermind game.



ILLUSTRATION BY PAUL SCHOFIELD

ASSEMBLY LINE

Carry on programming with your guide to assembly code by Dave Lawrence

Numbers form the backbone of Arm programming and in the last two issues we have looked at how to load registers with immediate constants and move numbers between registers. Due to the way constants are stored within instructions, you should now know the type of values that you can be used with MOV and MVN.

But this still has not told us how to load a constant, such as 257 or, indeed, 1,000,000? Well, there are in fact quite a few ways of doing this. The most obvious way is to split the problem up, 257 is 256 + 1, both of which are legal constants, so:

```
MOV  R0,#256
ADD  R0,R0,#1
```

should do the trick. It is also 159 + 98, but perhaps would not be quite as apparent to someone reading your code! Larger numbers, such as one million, are little more awkward to do as neatly as this. If you print the value of the number in hex (PRINT ~1000000) this effectively splits it up into pairs of eight-bit numbers (1000000=&4F240) all of which are allowable constants, this then leads to:

```
MOV R0,    #&040000
ADD R0,R0,#&00F200
ADD R0,R0,#&000040
```

as one possible solution. There is, however, a better one. Because the hex digit furthest to the right is zero, we needn't count it when splitting the number up. This allows:

```
MOV     R0,#&04F000
ADD R0,R0,#&000240
```

Also, watch out for pairs of zeros in the middle of the hex number. For instance, 259,000,000 can be loaded in just two instructions – can you work out which ones? (See our solution on the following page.) Similar calculated constants can be constructed with SUB and may often save a step: 643,000 is &9CFB8, which would normally need a MOV and two ADDs. It is also &9D000-&48, performed as follows:

```
MOV R0,#&9D000
SUB R0,R0,#&48
```

These are not always easy to spot, and it is only worth trying to find them if the speed of your code is of the essence. That's it for constants for the moment, we'll meet one more method for loading registers with values later in the series, but now it's on to ...

THE BARREL SHIFTER

The barrel shifter is a piece of electronic magic within the Arm chip! It allows numbers to be instantly shifted left and right, and I'll explain what this means below. To make use of this facility, all instructions we have met so far (except SWI, MUL & MLA) that take a register as their 'right most' parameter can take an extra parameter that controls the barrel shifter.

There are essentially two sorts of shift; left and right. Shifting a number to the left increases the significance of each bit, thus making it larger. Bit 0 moves into bit 1, bit 1 moves into bit 2 and so on. If you imagine the number 6, in binary, this is 110. Moving all the bits left one place (and adding a zero on to the right) produces 1100, which is 12 in decimal. So we have multiplied the number by two. Shifting it again produces 11000, equivalent to multiplying by four. Shifting a number right makes the number smaller, and 10010 (18) will become 1001 (9). Note that the 0 in bit 0 is lost. Shifting the value again will lose the 1 giving 100 or decimal 4. Again the number has been halved, but we have lost some information (the 1 that 'fell off'). More precisely, we have performed integer division, equivalent to the Basic DIV function.

Because of the way the Arm interprets its 32 bit instructions, there is room to describe a shift of any size (between 0 and 31 places), thus allowing you to multiply (or divide) a register

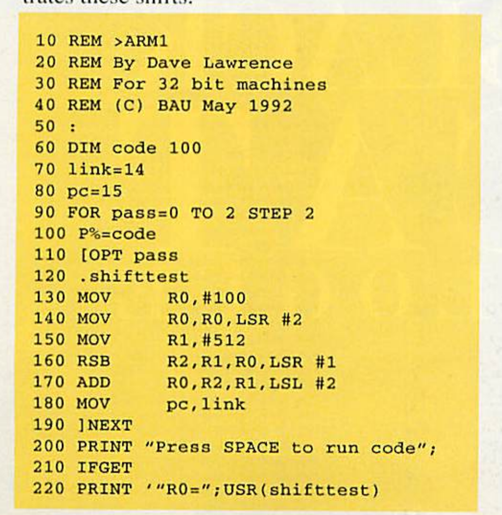
by 2, 4, 6, 8 and so on, using no extra time – a very handy beast indeed. For historical reasons, the names of the shifts are three letter abbreviations and the simplest one to understand is LSL or Logical Shift Left. As the name implies, this shifts a register left logically. The Shift and the Left are obvious, the Logical we'll come to a bit later. As mentioned above, these shifts are applied to registers that are already parameters to instructions – unlike other processors (such as 6502, 68000 where they are instructions in their own right).

The simplest example is therefore `MOV R0,R0,LSL #1` and, without the LSL #1, this would simply move register R0 back on top of itself – not very useful. However, with the LSL #1, the value of R0 passes through the barrel shifter and emerges on the other side, twice as big, before getting returned to R0. Similarly, `MOV R1,R2,LSL #8` would multiply R2 by 256 (2^8) and store the result in R1. A more interesting example is `ADD R0,R1,R2,LSL #3` which multiplies R2 by 8 (2^3), adds the result to R1, storing the result in R0.

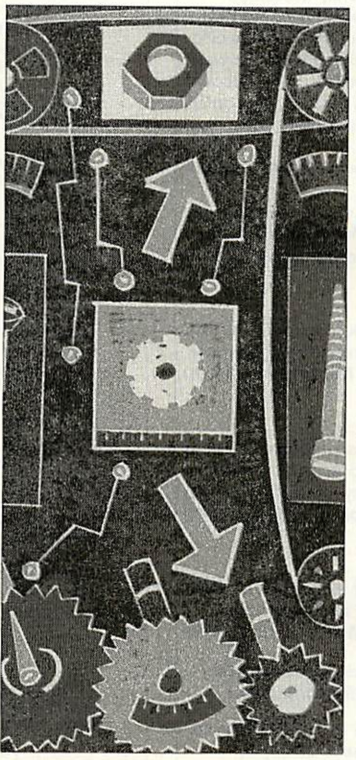
Bits will, of course, fall out of the top of the register, most of these are lost forever. One, however is remembered in the carry flag. We have not yet met flags, and I don't intend to start talking about them now, but just imagine this carry as a one bit register within the Arm processor. If a shift of one is used, the bit that is remembered is the old contents of bit 31. With a shift of two, it is the old contents of bit 30 and so on. A zero is inserted in bit 0.

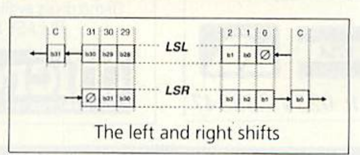
Compared to left shifting, right shifting is quite complex, as there are four different ways you can do it. I'll start with the simplest which could be viewed as the complement to LSL. This is LSR, sorry, no prizes for guessing what it stands for. Bits are shifted to the right, a 0 is placed in bit 31 and the old value of bit 0 'falls off' into the carry flag.

So `MOV R0,R0,LSR #1` divides R0 by 2 and `RSB R0,R2,R3,LSR #2` subtracts R2 from four times R3 and stores the result in R0. As you can see from this last example, you can perform some quite complex arithmetic. The most important thing to realise about these examples is that they take exactly the same time to execute as a simple MOV or ADD. Whoever said there's no such thing as a free lunch? The diagram above, illustrates these shifts.



```
10 REM >ARM1
20 REM By Dave Lawrence
30 REM For 32 bit machines
40 REM (C) BAU May 1992
50 :
60 DIM code 100
70 link=14
80 pc=15
90 FOR pass=0 TO 2 STEP 2
100 P%=code
110 [OPT pass
120 .shifttest
130 MOV     R0,#100
140 MOV     R0,R0,LSR #2
150 MOV     R1,#512
160 RSB     R2,R1,R0,LSR #1
170 ADD     R0,R2,R1,LSL #2
180 MOV     pc,link
190 ]NEXT
200 PRINT "Press SPACE to run code";
210 IFGET
220 PRINT '"R0=";USR(shifttest)
```





The left and right shifts

SOLUTION

```
259,000,00=&F7006C0
MOV R0,#&F700000
ADD R0,R0,#&6C0
```

Example program *Arm1* shows these shifts in a real program, but try to predict the answer before running the code.

QUICK MULTIPLIES

One very useful upshot of the barrel shifter is that it can perform some multiplications in a way that is much faster than the built-in MUL command. MUL is reasonably zippy, but in certain situations it may be desirable to 'hand code' a multiply for that extra burst of speed. As an example, multiplying R0 by three can be performed with `ADD R0,R0,R0,LSL #1`.

In English, this means add the value of R0 to R0 multiplied by 2. (R0 + 2 × R0 = 3 × R0). Multiplying by seven can be done with `RSB R0,R0,R0,LSL #3`. Or, 8 × R0 - R0 = 7 × R0.
In other words, any multiplication of one more, or one less, than a power of two is possible using a simple ADD or RSB. Larger products can be built up in a similar way to the method of building large constants, 10 = 5 × 2. So, multiplying by ten, can be performed with two instructions:

```
ADD R0,R0,R0,LSL #2
MOV R0,R0,LSL #1
```

Of course, other registers can be incorporated into this, if you wanted R1 to end up with the final result, you'd simply change the first R0 after the MOV. Many graphical programs within *BAU* directly access the screen memory for speed. I won't go into too much detail here, but in such a program you often need to multiply by 320 and add this to a previously calculated value. This is usually done with two ADDs:

```
ADD R2,R9,R1,LSL #6
ADD R2,R2,R1,LSL #8
```

Firstly, R1 is multiplied by 64 and added to the previous calculation (R9). This total is then added to R1 multiplied by 256. The final value of R2 is therefore:

R2 = R9 + R1 × 64 + R1 × 256
R2 = R9 + R1 × (64 + 256)
R2 = R9 + R1 × 320

This gives the desired result. Perhaps you'd like to fiddle around with the example program to make it perform some of the larger calculations.

As if all this wasn't enough, instead of a constant shift, you are allowed to supply yet another register instead. The amount shifted is then controlled by the bottom eight bits of this extra register. This is not quite as 'free' as a constant shift, and does take a little longer to execute. An example of such an instruction is: `ADD R1,R2,R3,LSL R4,` that adds R2 to R3 shifted left R4 places, or $R2 + R3 \times 2^{R4}$.

Quite a hefty calculation, I think you'll agree. This facility is rarely used in programs as it is quite difficult to think of a use for it. You may want to use it with R3 set to 1 (as in the above example). R4 then controls the position of this single 'bit' and is quite handy for setting, clearing and testing individual bits within a word (more on this later.) You may remember I mentioned four different sorts of right shift? Next month you will find out what the other three are.

In the meantime, here's a small challenge. Assuming that R0 contains a number, how can you multiply by 3600 in just three instructions? And no, of course, you cannot use MUL or MLA. Solutions in next month's issue!

FREE ADS

● Risc OS 2 programmers reference manuals, in good condition. Will sell for £30. Contact Paul, Tel: 081-682 0428 eves.

● BBC B, 14in colour monitor, 40/80 track drive, 2nd processor – £270. B (issue 7) DFS – £80. B+ (128K) – £125. Contact Mr A. Roberts, Alfreton. Tel: (0773) 831361.

● BBC B, colour monitor, recorder, twin drives, Watford Rom/Ram board (full) replay, teletext, manuals, books, games, excellent condition, boxed – £450. Contact Ian Twisleton, Kingsthorpe. Tel: (0604) 845257

● A3000, 2Mb Ram, Acorn colour monitor + monitor stand, original manuals + application discs – £600 o.n.o. All good condition. Contact Alasdair Marshall, Staffordshire. Tel: (0785) 760085

● Complete set 'Disk User' mags + discs – £40. Boxed Dumpout 3 – £15. Peartree, mini Rom board – £15. DTP for beeb – £15. Contact Danny 071-379 5656 Ext 2151, office hours.

● BBC Master compact, monitor 3.5in disc drive, wordwise plus, games – £300 o.n.o. Contact Mrs E. Cox, Southampton. Tel: (0703) 556405

● Master 128, single 40/80 DSDD drive, MOSplus, Rom cartridges, serious software, games, all boxed with manuals. Excellent package – £350 o.n.o. Contact Andrew Stribblehill, Worcs. Tel: (0299) 35783

● Kaga colour computer monitor – £30. Single 40 track disc drive – £15. Contact Mr P. Huddart, Winchester. Tel: (0962) 88654

● Master compact + mega 3 Rom, monitor, 9pin printer, software – £400 o.n.o. Contact Richard Iles, Scotland. Tel: (0506) 413434

● A3000 hard disc controller for MFM hard drives inc cables and podule case, 6 months old – £75. Contact C. Morrison, Edinburgh. Tel: (031) 339 6979

● A310M, DTP software, PC Emulator (1.6), Render Bender, Genesis, Games – £540, EMR sound sampler – £60, Watford video digitiser – £75, Acorn colour monitor – £110. Contact Stephen Hartley, Manchester. Tel: (061) 973 0529 (after 6pm)

● BBC Issue 7, 40/80 disc drive, 32k Shadow Ram, 16k Sideways Ram, Rom board, Plinth, Interword, Pascal, Forth, books, joysticks – £250. Contact John Lee, Chelmsford. Tel: (0245) 263451

● Acorn 1st Word Plus Release 2 – £25. Contact J. F. Phillips, Sevenoaks. Tel: (0732) 454707

● Master hard disc 30Mb – £145, Roms Interword – £25, Viewstore – £15, Dumpout3, Moviemaker, Mos+, ADT, Fontwise, + manuals – £10 +p/p. Contact Mr A. Fazakerley, Middlesex. Tel: 081- 864 0309

● BBC M128, MOS 3.5in full start up system, plus many extras – £500. Contact Brian Watson. Tel: 071- 267 9076

● Archimedes software for sale inc 1st word – £40, Genesis – £33, plus many games. For full list send SAE to S. Sutton, 274 Northfield Ave, London, W5 4UB

● Master 128k with extras inc mouse, Artroom, Genie, Viewstore, Spellmaster in cartridge, Rom cartridge system, disc drive – £275. Contact A. McMullon, Lincoln. Tel: (0522) 730821

● BBC spares items, 1.2 operating systems Rom – £3 each, keyboard key switches – £1 each. Contact Pete Ashby, Yateley. Tel: (0252) 878148

● Electron Plus 1, View Rom, JP101 Printer (unused), Phillips monitor 80 Voltmace, joysticks – £150. Contact M. Hemming, Hook. Tel: Hook 763771

● BBC Master 128, Wordwise, Spellwise, Cumana single d/drive – £390 o.n.o. or sell individually plus software and printer. Contact Richard Collisson, Walthamstow. Tel: 081- 509 0560 (evenings only)

● Wanted: Acorn/Archimedes A3000, A420/1 or A440/1. Complete system prefered. Contact Mr N. Duffield, Coventry. Tel: (0203) 445174

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Program	Page	BBC B B+	B+/ 128	Master 128	Master Compact	Electron	6502SP/ Turbo	ADFS	Econet	Shadow Ram	Archimedes/ A3000/A5000	Monthly disc
∗Info	**71**											
Info 1-2											■	■
Info 3-4		■	■	■	■	■	■	■	■	■		■
Info 5-8											■	■
Info 9-10		■	■	■	■	■	■	■	■	■		■
Info 11											■	■
Info 12-13		■	■	■	■	■	■	■	■	■	■	■
Info 14-20											■	■
Pieces of Eight	**67**											
Po81			■	■	■		■	■	■	■	■	■
Po82			■	■	■		■	■	■	■	■	■
Po83		■	■	■	■		■	■	■	■	■	■
Po84		■	■	■	■	■	■	■	■	■	■	■

Typing in listings from the yellow pages.

The yellow pages are subdivided into article headings. Each article heading corresponds with its article in the magazine.

So for instance to find listing five of ∗INFO in the yellow pages (Fire32) look for the ∗INFO heading, then follow the listings through until you get to listing five.

At the beginning of the program are a few lines that tell you what machines it works on. This information can also be derived from the table above.

For Archimedes owners it may not be immediately obvious how to actually type in the listings. By pressing Function key 12 you can access the command line. From here type BASIC and the Archimedes will enter the Basic language. You may like to type MODE 12, which will turn the screen to white on black.

Then simply copy each line of the program in turn after the '>' prompt, pressing RETURN when finished. Save the program onto disc by typing SAVE"<filename>". It can then be run by typing RUN. You will probably need to debug it as you may have made some typing errors.

When you have finished debugging save the program one last time. Then it can either be double-clicked upon from the desktop, or loaded using LOAD"<filename>".

A more detailed description of how to type in listings from the yellow pages is in BBC Acorn User August 91.

∗INFO

Listing 1

```
   10 REM >SquashS (Info1)
   20 REM By Brian Cooke
   30 REM For RiscOS 3 only
   40 REM (C) BAU May 1992
   50 :
   60 ON ERROR CLOSE #0:PRINTREPORT$;" a
t line ";ERL:END
   70 InSize=1024
   80 PROCcode
   90 SYS "OS_File",10,"%.SquashUtil",&F
FA,,code,O%
  100 SYS "OS_Module",11,code,O%-code
  110 END
  120 :
  130 DEF PROCcode
  140 wp_next=0
  150 Input=FNwp(4)
  160 Work=FNwp(4)
  170 InputSize=FNwp(4)
  180 Handle=FNwp(4)
  190 attr=FNwp(4)
  200 RMA_SIZE=wp_next
  210 :
  220 DIM code &8000
  230 wp=12
  240 sp=13
  250 link=14
  260 pc=15
  270 FOR pass=4 TO 6 STEP 2:P%=0:O%=cod
e
  280 [OPT pass
  290         EQUD    0
  300         EQUD    Init_Code
  310         EQUD    Final_Code
  320         EQUD    0
  330         EQUD    Title_String
  340         EQUD    Help_String
  350         EQUD    0
  360         EQUD    %1101111111111000
000
  370         EQUD    SWI_Handler
  380         EQUD    SWI_Names
  390         EQUD    0
  400
  410 .Title_String
  420         EQUS    "SquashUtils"
  430         EQUB    0
  440
  450 .Help_String
  460         EQUS    "Squash Utils"
  470         EQUB    9
  480         EQUS    "0.01 (15 Feb 1992
) Brian Cooke"
  490         EQUB    0
  500         ALIGN
  510 .SWI_Names
  520         EQUS    "Squashed"
  530         EQUB    0
  540         EQUS    "Load"
  550         EQUB    0
  560         EQUS    "Info"
  570         EQUB    0
  580         EQUB    0
  590
  600         ALIGN
  610
  620 .Init_Code
  630         STMFD   (sp)!,{R1-R4,link}
  640         MOV     R0,#6
  650         MOV     R3,#RMA_SIZE
  660         SWI     "XOS_Module"
  670         BVS     no_init
  680         STR     R2,[R12]
  690 .no_init
  700         LDMFD   (sp)!,{R1-R4,pc}
  710
  720 .Final_Code
  730         STMFD   (sp)!,{R1-R4,link}
  740         LDR     wp,[R12]
  750         MOV     R0,#7
  760         MOV     R2,wp
  770         SWI     "XOS_Module"
  780         LDMFD   (sp)!,{R1-R4,pc}
  790 :
  800 .SWI_Handler
  810         LDR     wp,[R12]
  820         CMP     R11,#(eojt-jt)/4
  830         ADDCC   pc,pc,R11,LSL #2
  840         B       Unknown_SWI
  850 .jt
  860         B       SWI_Load
  870         B       SWI_Info
  880 .eojt
  890 .Unknown_SWI
  900         ADR     R0,unknown_error
  910         ORRS    pc,link,#1<<28
  920 .unknown_error
  930         EQUD    &1E6
  940         EQUS    "Unknown squash op
eration"
  950         EQUB    0
  960         ALIGN
  970
  980 .Exit_Error
  990         LDMFD   (sp)!,{R1-R11,link
}
 1000         ORRS    pc,link,#1<<28
 1010
 1020 .OpenFile
 1030         ; R0->file
 1040         STMFD   (sp)!,{R1-R11,link
}
 1050
 1060         MOV     R1,#0
 1070         STR     R1,[wp,#Input]
 1080         STR     R1,[wp,#Work]
 1090         STR     R1,[wp,#Handle]
 1100
 1110         MOV     R1,R0
 1120         MOV     R0,#20
 1130         SWI     "XOS_File"
 1140         BVS     ExitOpen
 1150         CMP     R0,#1
 1160         BEQ     IsFile
 1170
 1180         MOV     R2,R0
 1190         MOV     R0,#19
 1200         SWI     "XOS_File"
 1210         B       ExitOpen
 1220 .SquashHead
 1230         EQUS    "SQSH"
 1240 .SquashType
 1250         EQUD    &FCA
 1260 .IsFile
 1270         LDR     R0,SquashType
 1280         CMP     R6,R0
 1290         BEQ     IsSquash
 1300
 1310 .NotSquash
 1320         ADR     R0,NotSquashErr
 1330         B       Exit_Error
 1340 .NotSquashErr
 1350         EQUD    256
 1360         EQUS    "Not a squashed fi
le"
 1370         EQUB    0
 1380         ALIGN
 1390 .IsSquash
 1400         STR     R5,[wp,#attr]
 1410         MOV     R0,#6
 1420         MOV     R3,#InSize
 1430         SWI     "XOS_Module"
 1440         BVS     ExitOpen
 1450         STR     R2,[wp,#Input]
 1460
 1470         MOV     R0,#&40
 1480         SWI     "XOS_Find"
 1490         BVS     ExitOpen
 1500         CMP     R0,#0
 1510         BLEQ    UnClaim
 1520         BEQ     NotSquash
 1530         STR     R0,[wp,#Handle]
 1540
 1550         LDR     R0,[wp,#Input]
 1560         MOV     R1,#20
 1570         BL      GetBytes
 1580         BLVS    UnClaim
 1590         BVS     ExitOpen
 1600
 1610         LDR     R9,[wp,#Input]
 1620         LDR     R0,SquashHead
 1630         LDR     R1,[R9,#0]
 1640         CMP     R0,R1
 1650         BEQ     ExitOpen
 1660
 1670         BL      UnClaim
 1680         ADR     R0,NoHeaderErr
 1690         B       Exit_Error
 1700 .NoHeaderErr
 1710         EQUD    256
 1720         EQUS    "Unrecognised squa
sh file"
 1730         EQUB    0
 1740         ALIGN
 1750
 1760 .ExitOpen
 1770         LDMFD   (sp)!,{R1-R11,pc}
 1780
 1790 .SWI_Info
 1800         ; R0 -> filename
 1810         STMFD   (sp)!,{R1,R7-R11,l
ink}
 1820         BL      OpenFile
 1830         BVS     ExitInfo
 1840
 1850         LDR     R9,[wp,#Input]
 1860         LDR     R2,[R9,#8]
 1870         LDR     R3,[R9,#12]
 1880         LDR     R4,[R9,#4]
 1890         LDR     R5,[wp,#attr]
 1900         LDR     R6,TestMask
 1910         AND     R0,R2,R6
 1920         CMP     R0,R6
 1930         MVNNE   R6,#NOT -1
 1940         LDREQ   R6,TypeMask
 1950         ANDEQ   R6,R2,R6
 1960         MOVEQ   R6,R6,LSR #8
 1970
 1980         MOV     R0,#1
 1990 .ExitInfo
 2000         BL      UnClaim
 2010
 2020         LDMFD   (sp)!,{R1,R7-R11,p
c}
 2030 .TestMask
 2040         EQUD    &FFF00000
 2050 .TypeMask
 2060         EQUD    &000FFF00
 2070
 2080 .SWI_Load
 2090         ; R0 -> filename, [R1=addr
ess]
 2100         STMFD   (sp)!,{R1-R11,link
}
 2110
 2120         BL      OpenFile
 2130         BVS     ExitLoad
 2140
 2150         LDR     R9,[wp,#Input]
 2160         MOVS    R4,R1
 2170         LDREQ   R4,[R9,#8]
 2180
 2190         MOV     R0,#%1000
 2200         MOV     R1,#InSize
 2210         SWI     "XSquash_Decompres
s"
 2220         MOV     R3,R0
 2230         MOV     R0,#6
 2240         SWI     "XOS_Module"
 2250         BVS     ExitLoad
 2260         STR     R2,[wp,#Work]
```

►




```
 2270
 2280         LDR     R5,[R9,#4]
 2290         MOV     R3,#0 ; (unused, t
urned into bytes)
 2300         MOV     R8,#0 ; 0=start
 2310 .DeLoop
 2320         CMP     R3,#0
 2330         BEQ     NoShuffle
 2340         LDR     R1,[wp,#Input]
 2350         ADD     R2,R1,#InSize
 2360         SUB     R2,R2,R3
 2370         MOV     R9,R3
 2380 .shuffle
 2390         LDRB    R0,[R2],#1
 2400         STRB    R0,[R1],#1
 2410         SUBS    R9,R9,#1
 2420         BNE     shuffle
 2430 .NoShuffle
 2440         LDR     R0,[wp,#Input]
 2450         ADD     R0,R0,R3
 2460         RSB     R1,R3,#InSize
 2470         BL      GetBytes \ (R0=not
got)
 2480         MOVS    R9,R0
 2490         RSB     R3,R0,#InSize
 2500
 2510         MOV     R0,R8
 2520         ORREQ   R0,R0,#%10
 2530
 2540         \ R0 = start OR (continue<
<1)
 2550         LDR     R1,[wp,#Work]
 2560         LDR     R2,[wp,#Input]
 2570         \ R3 = bytes (=unused on e
xit)
 2580         \ R4 = output (updated)
 2590         \ R5 = size left (updated)
 2600         SWI     "XSquash_Decompres
s"
 2610         BLVS    UnClaim
 2620         BVS     Exit_Error
 2630
 2640         MOV     R8,#1
 2650
 2660         CMP     R9,#0
 2670         BEQ     DeLoop
 2680
 2690 .ExitLoad
 2700         BL      UnClaim
 2710
 2720         LDMFD   (sp)!,{R1-R11,pc}
 2730
 2740 .GetBytes
 2750         STMFD   (sp)!,{R1-R4,link}
 2760         MOV     R3,R1
 2770         MOV     R2,R0
 2780         LDR     R1,[wp,#Handle]
 2790         MOV     R0,#4
 2800         SWI     "XOS_GBPB"
 2810         MOV     R0,R3
 2820         LDMFD   (sp)!,{R1-R4,pc}
 2830
 2840 .UnClaim
 2850         STMFD   (sp)!,{R0-R2,link}
 2860
 2870         MOV     R0,#7
 2880         LDR     R2,[wp,#Input]
 2890         CMP     R2,#0
 2900         SWINE   "XOS_Module"
 2910
 2920         MOV     R0,#7
 2930         LDR     R2,[wp,#Work]
 2940         CMP     R2,#0
 2950         SWINE   "XOS_Module"
 2960
 2970         MOV     R0,#0
 2980         LDR     R1,[wp,#Handle]
 2990         CMP     R1,#0
 3000         SWINE   "XOS_Find"
 3010
 3020         LDMFD   (sp)!,{R0-R2,pc}^
 3030 ]NEXT
 3040 ENDPROC
 3050 :
 3060 DEF FNwp(size)
 3070 wp_next+=size
 3080 =wp_next-size
```

Listing 2

```
   10 REM >SquashDemo (Info2)
   20 REM By Brian Cooke
   30 REM For RiscOS 3 only
   40 REM (C) BAU May 1992
   50 :
   60 ON ERROR CLOSE #0:PRINTREPORT$;" a
t line ";ERL:END
   70 INPUT"Squashed file : "in$
   80 input_size=256
   90 in=OPENIN(in$)
  100 sqsh=FNword
  110 length=FNword
  120 load%=FNword
  130 exec%=FNword
  140 SYS "Squash_Decompress",%1000,inpu
t_size TO ws_size
  150 DIM space length,input input_size,
ws ws_size
  160 SYS "OS_Args",1,in,20
  170 output=space
  180 end=space+length
  190 unused=0
  200 PRINT"    PTR#in","    Status","
Unused"," Unpacked"
  210 start=0
  220 REPEAT
  230 at=PTR#in-20
  240 IF unused<>0 THEN
  250 FOR byte=0 TO unused-1
  260 input?byte=input?(input_size-unuse
d+byte)
  270 NEXT
  280 ENDIF
  290 SYS "OS_GBPB",4,in,input+unused,in
put_size-unused TO ,,,not_got
  300 bytes=input_size-not_got
  310 IF bytes=input_size continue=1 ELS
E continue=0
  320 SYS "Squash_Decompress",start OR (
continue<<1),ws,input,bytes,output,end-o
utput TO status,,,unused,output
  330 start=1
  340 PRINTat,status,unused,output-space
  350 UNTIL status=0
  360 CLOSE #in
  370 INPUT"Save as        : "out$
  380 SYS "OS_File",0,out$,load%,exec%,s
pace,end
  390 END
  400 :
  410 DEF FNword
  420 =BGET#in OR BGET#in<<8 OR BGET#in<
<16 OR BGET#in<<24
```

Listing 3

```
   10 REM >MFSrce (Info3)
   20 REM By Clive Whiston
   30 REM For Eight-bit machines
   40 REM (C) BAU May 1992
   50 :
   60 ON ERROR PROCerror:END
   70 :
   80 MODE 7
   90 PRINT "MegaFont code:"
  100 :
  110 PROCinitialise
  120 PROCassemble_code
  130 PROCcheck_code
  140 PROCsave_code
  150 :
  160 PRINT TAB(15,0) "Complete"
  170 END
  180 :
  190 DEF PROCerror
  200 PRINT TAB(15,0) "Error    "
  210 REPORT
  220 PRINT " in line ";STR$(ERL)
  230 ENDPROC
  240 :
  250 DEF PROCinitialise
  260 charact=&70
  270 buffer =&71
  280 stringb=&7A
  290 textlen=&80
  300 textptr=&81
  310 store  =&82
  320 font   =&84
  330 cmpfont=&85
  340 stringp=&0600
  350 command=&0700
  360 code   =&0900
  370 osnewl =&FFE7
  380 oswrch =&FFEE
  390 osword =&FFF1
  400 oscli  =&FFF7
  410 megasym=ASC"|"
  420 ENDPROC
  430 :
  440 DEF PROCassemble_code
  450 PRINT TAB(15,0) "Compiling"
  460 FOR assemble=0 TO 2 STEP 2
  470 P%=code
  480 :
  490 [OPT assemble
  500 RTS
  510 :
  520 .mf
  530 LDA stringp+1
  540 STA stringb
  550 LDA stringp+2
  560 STA stringb+1
  570 LDY #&03
  580 LDA (stringb),Y
  590 STA textlen
  600 LDY #&00
  610 LDA (stringb),Y
  620 STA stringb+2
  630 INY
  640 LDA (stringb),Y
  650 STA stringb+3
  660 LDA #&FF
  670 STA textptr
  680 JSR reset_mf_style_flags_command
  690 .mf_loop
  700 LDY textptr
  710 CPY textlen
  720 BEQ mf_loop_exit
  730 CMP mf_control_code_symbol
  740 BEQ mfcode_interpreter
  750 LDA font
  760 CMP #&00
  770 BNE mf_format_flags
  780 LDA cmpfont
  790 CMP #&00
  800 BEQ no_flags
  810 .mf_format_flags
  820 LDA store
  830 CMP buffer
  840 BEQ output_mf_character_step
  850 JMP mf_small_caps
  860 .mf_loop_exit
  870 JSR reset_mf_style_flags
  880 RTS
  890 :
  900 .no_flags
  910 LDA buffer
  920 JSR oswrch
  930 JMP mf_loop_continue
  940 :
  950 .increase_mf_loop_counter
  960 LDA buffer
  970 STA store
  980 INC textptr
  990 LDY textptr
 1000 LDA (stringb+2),Y
 1010 STA buffer
 1020 RTS
 1030 :
 1040 .output_mf_character_step
 1050 JMP output_mf_character
 1060 :
 1070 .mfcode_interpreter
 1080 JSR increase_mf_loop_counter
 1090 LDY #0
 1100 .mfcode_interpreter_loop
 1110 CMP mfcode_data_block_start,Y
 1120 BEQ mfcode_interpreter_font_toggle
 1130 INY
 1140 CPY #mfcode_data_block_end-mfcode_
data_block_start+1
 1150 BNE mfcode_interpreter_loop
 1160 .undefined_mfcode_error
 1170 BRK
 1180 OPT FNequb(&FF)
 1190 OPT FNequs("Un-defined MegaFont co
de")
 1200 BRK
 1210 .mfcode_interpreter_font_toggle
 1220 LDX #207
 1230 STX store+1
 1240 TYA
 1250 SBC #8
 1260 BMI toggle_mfs
 1270 CMP #&05
 1280 BEQ reset_mf_style_flags_command
 1290 CMP #&06
 1300 BEQ output_line_feed
 1310 CMP #&07
 1320 BEQ change_mf_foreground_colour
 1330 CMP #&08
 1340 BEQ change_mf_background_colour
 1350 CMP #&09
 1360 BEQ output_mf_control_code_symbol
 1370 .toggle_mf_position_flag
 1380 ADC #&01
 1390 CMP cmpfont
 1400 BEQ clear_mf_position_flag
 1410 STA cmpfont
 1420 JMP mfcode_interpreter_exit
 1430 .clear_mf_position_flag
 1440 LDA #&00
 1450 STA cmpfont
 1460 JMP mfcode_interpreter_exit
 1470 .toggle_mfs
 1480 LDA #&01
 1490 STA store
 1500 CPY #&00
 1510 BEQ toggle_mfs_exit
 1520 STY store+1
 1530 LDX #&00
 1540 CLC
 1550 .toggle_mfs_loop
 1560 ADC store
 1570 STA store
 1580 INX
 1590 CPX store+1
 1600 BNE toggle_mfs_loop
 1610 .toggle_mfs_exit
 1620 LDA font
 1630 EOR store
 1640 STA font
 1650 JMP mfcode_interpreter_exit
 1660 .output_mf_control_code_symbol
 1670 LDA mf_control_code_symbol
 1680 STA buffer
 1690 JMP mf_define_character
 1700 .change_mf_background_colour
 1710 LDX #79
 1720 .change_mf_foreground_colour
 1730 STX store+1
 1740 JSR increase_mf_loop_counter
 1750 ADC store+1
 1760 TAY
 1770 JSR change_colour
 1780 JMP mfcode_interpreter_exit
 1790 .output_line_feed
 1800 JSR osnewl
 1810 JMP mfcode_interpreter_exit
 1820 .reset_mf_style_flags_command
 1830 JSR reset_mf_style_flags
 1840 .mfcode_interpreter_exit
 1850 JSR increase_mf_loop_counter
 1860 LDY #&00
 1870 STY store
 1880 JMP mf_loop
 1890 .reset_mf_style_flags
 1900 LDY #7
 1910 JSR change_colour
 1920 LDY #128
 1930 JSR change_colour
 1940 LDA #&00
 1950 LDX #store
 1960 .reset_mf_style_flags_loop
 1970 STA &00,X
 1980 INX
 1990 CPX #cmpfont+1
 2000 BNE reset_mf_style_flags_loop
 2010 RTS
 2020 .change_colour
 2030 LDA #17
 2040 JSR oswrch
 2050 TYA
 2060 JSR oswrch
 2070 RTS
 2080 .mfcode_data_block_start
 2090 OPT FNequs("BIUHRFDS2+-OCN.XY")
 2100 .mf_control_code_symbol
 2110 OPT FNequb(megasym)
 2120 .mfcode_data_block_end
 2130 :
 2140 .resume_loop
 2150 LDA #&17
 2160 JSR oswrch
 2170 LDA #&FF
 2180 JSR oswrch
 2190 LDX #&00
 2200 .resume_loop_loop
 2210 LDA buffer+1,X
 2220 JSR oswrch
 2230 INX
 2240 CPX #&08
 2250 BNE resume_loop_loop
 2260 .output_mf_character
 2270 LDA #&FF
 2280 JSR oswrch
 2290 .mf_loop_continue
 2300 JSR increase_mf_loop_counter
 2310 JMP mf_loop
 2320 :
 2330 .mf_small_caps
 2340 LDA cmpfont
 2350 CMP #5
 2360 BNE mf_define_character
 2370 LDA buffer
 2380 SBC #97
 2390 BMI mf_define_character
 2400 SBC #26
 2410 BPL mf_define_character
 2420 ADC #91
 2430 STA buffer
 2440 LDA #6
 2450 STA cmpfont
 2460 :
 2470 .mf_define_character
 2480 LDA #&0A
 2490 LDX #buffer
 2500 LDY #&00
 2510 JSR osword
 2520 :
 2530 .mf_bold
 2540 LDA font
 2550 ORA #&01
 2560 CMP font
 2570 BNE mf_faint
 2580 LDX #0
 2590 .mf_bold_loop
 2600 LDA buffer+1,X
 2610 ASL A
 2620 ORA buffer+1,X
 2630 STA buffer+1,X
 2640 INX
 2650 CPX #8
 2660 BNE mf_bold_loop
 2670 :
 2680 .mf_faint
 2690 LDA font
 2700 ORA #&20
 2710 CMP font
 2720 BNE mf_digital
 2730 LDX #0
 2740 .mf_faint_loop
 2750 LDA buffer+1,X
 2760 ASL A
 2770 AND buffer+1,X
 2780 STA buffer+1,X
 2790 INX
 2800 CPX #8
 2810 BNE mf_faint_loop
 2820 :
 2830 .mf_digital
 2840 LDA font
 2850 ORA #&40
 2860 CMP font
 2870 BNE mf_shadow
 2880 LDY #3
 2890 STY store
 2900 LDA buffer
 2910 LDX #0
 2920 SBC #96
 2930 BMI mf_digital_loop
 2940 SBC #27
 2950 BPL mf_digital_loop
 2960 LDY #4
 2970 STY store
 2980 .mf_digital_loop
 2990 LDA buffer+1,X
 3000 ASL A
 3010 AND buffer+1,X
 3020 STA buffer+1,X
 3030 INX
 3040 CPX store
 3050 BNE mf_digital_loop
 3060 :
 3070 .mf_shadow
 3080 LDA font
 3090 ORA #&80
 3100 CMP font
 3110 BNE mf_italic
 3120 LDX #0
 3130 .mf_shadow_loop
 3140 LDA buffer+1,X
 3150 ASL A
 3160 AND buffer+1,X
 3170 EOR buffer+1,X
 3180 STA buffer+1,X
 3190 INX
 3200 CPX #8
 3210 BNE mf_shadow_loop
 3220 :
 3230 .mf_italic
 3240 LDA font
 3250 ORA #&02
 3260 CMP font
 3270 BNE mf_double_underline
```

```
3280 LDX #0
3290 .mf_italic_loop
3300 LDA buffer+1,X
3310 LSR A
3320 STA buffer+1,X
3330 LDA buffer+6,X
3340 ASL A
3350 STA buffer+6,X
3360 INX
3370 CPX #2
3380 BNE mf_italic_loop
3390 LDA buffer+8
3400 ASL A
3410 STA buffer+8
3420 JMP mf_double_underline
3430 :
3440 .resume_loop_step_1
3450 JMP resume_loop
3460 :
3470 .compress
3480 LDA buffer+3
3490 STA buffer+2
3500 LDA buffer+4
3510 STA buffer+3
3520 LDA buffer+6
3530 STA buffer+4
3540 LDA buffer+8
3550 STA buffer+6
3560 LDX buffer+5
3570 LDA buffer+6
3580 CMP #0
3590 BNE compress_exit
3600 LDA buffer
3610 CMP #ASC"e"
3620 BEQ notail2
3630 CMP #ASC"s"
3640 BEQ notail2
3650 CMP #ASC"?"
3660 BEQ notail2
3670 CMP #ASC"!"
3680 BEQ notail2
3690 CMP #ASC"5"
3700 BEQ notail2
3710 CMP #ASC"x"
3720 BEQ notail2
3730 STX buffer+4
3740 JMP compress_exit
3750 .notail2
3760 STX buffer+3
3770 .compress_exit
3780 LDA buffer+7
3790 STA buffer+5
3800 LDA #&00
3810 STA buffer+7
3820 STA buffer+8
3830 RTS
3840 :
3850 .mf_double_underline
3860 LDA cmpfont
3870 CMP #1
3880 BNE mf_superscript
3890 JSR compress
3900 LDA #&FF
3910 STA buffer+8
3920 LDX buffer+6
3930 CPX #0
3940 BNE mf_rule_jump
3950 STA buffer+6
3960 JMP mf_rule_jump
3970 :
3980 .mf_superscript
3990 LDA cmpfont
4000 CMP #2
4010 BNE mf_subscript
4020 JSR compress
4030 JMP mf_underline
4040 :
4050 .mf_subscript
4060 LDA cmpfont
4070 CMP #6
4080 BEQ mf_subscript_resume
4090 CMP #3
4100 BNE mf_outline
4110 .mf_subscript_resume
4120 JSR compress
4130 LDX #&05
4140 .mf_subscript_loop
4150 LDA buffer+1,X
4160 STA buffer+3,X
4170 DEX
4180 CPX #&FF
4190 BNE mf_subscript_loop
4200 LDA #&00
4210 STA buffer+1
4220 STA buffer+2
4230 LDA #6
4240 CMP cmpfont
4250 BNE mf_underline
4260 DEC cmpfont
4270 JMP mf_underline
4280 :
4290 .mf_rule_jump
4300 JMP mf_rule
4310 :
4320 .mf_outline
4330 LDA cmpfont
4340 CMP #4
4350 BNE mf_underline
4360 JSR compress
4370 LDA buffer+6
4380 STA buffer+8
4390 LDX #&05
4400 .mf_outline_loop
4410 LDA buffer+1,X
4420 ASL A
4430 STA store
4440 LDA buffer+1,X
4450 LSR A
4460 ORA store
4470 CPX #&00
4480 BEQ mf_outline_loop_resume
4490 ORA buffer,X
4500 .mf_outline_loop_resume
4510 ORA buffer+2,X
4520 EOR buffer+1,X
4530 STA buffer+2,X
4540 DEX
4550 CPX #&FF
4560 BNE mf_outline_loop
4570 JMP mf_underline
4580 :
4590 .resume_loop_step_2
4600 JMP resume_loop_step_1
4610 :
4620 .mf_underline
4630 LDA font
4640 ORA #&04
4650 CMP font
4660 BNE mf_rule
4670 LDA buffer+8
4680 CMP #0
4690 BNE mf_rule
4700 LDA #&FF
4710 STA buffer+8
4720 :
4730 .mf_rule
4740 LDA font
4750 ORA #&10
4760 CMP font
4770 BNE mf_highlight
4780 LDA #&FF
4790 STA buffer+5
4800 :
4810 .mf_highlight
4820 LDA font
4830 ORA #&08
4840 CMP font
4850 BNE resume_loop_step_2
4860 LDX #0
4870 .mf_highlight_loop
4880 LDA buffer+1,X
4890 EOR #&FF
4900 STA buffer+1,X
4910 INX
4920 CPX #8
4930 BNE mf_highlight_loop
4940 JMP resume_loop_step_2
4950 ]
4960 :
4970 NEXT
4980 ENDPROC
4990 :
5000 DEF PROCcheck_code
5010 PRINT TAB(15,0) "Checking "
5020 FOR pointer%=code TO P%-1
5030 check%=check%+?pointer%
5040 NEXT
5050 IF check%=89589 THEN ENDPROC
5060 PRINT TAB(15,0) "Error   "
5070 PRINT'"Checksum is incorrect."
5080 PRINT "Check program listing for a
ny errors."
5090 END
5100 :
5110 DEF PROCsave_code
5120 PRINT TAB(15,0) "Saving  "
5130 $command="Save MFCode "+STR$~(code
)+" "+STR$~(P%)+" "+STR$~(code)
5140 A%=0
5150 X%=command MOD &100
5160 Y%=command DIV &100
5170 CALL oscli
5180 ENDPROC
5190 :
5200 DEF FNequb(B%)
5210 ?P%=B%
5220 P%=P%+1
5230 =assemble
5240 :
5250 DEF FNequs(s$)
5260 $P%=s$
5270 P%=P%+LEN(s$)
5280 =assemble
```

Listing 4

```
   10 REM >MFDemo (Info4)
   20 REM By Clive Whiston
   30 REM For Eight-bit machines
   40 REM (C) BAU May 1992
   50 :
   60 ON ERROR CLS:VDU20:END
   70 :
   80 MODE 0
   90 :
  100 PROCinitialise
  110 PROCdisplay_screen
  120 END
  130 :
  140 DEF PROCinitialise
  150 VDU 23,1,0;0;0;0;
  160 VDU 19,1,0;0;
  170 VDU 23,64,60,66,153,161,161,153,66
,60
  180 command=&0700
  190 code   =&0900
  200 oscli  =&FFF7
  210 PROCoscli("Load MFCode "+STR$~(cod
e))
  220 fonts$="NNormal#BBold#UUnderline#I
Italic#FFaint#HHighlight#+Superscript#-S
ubscript#2Double underline#CSmall caps#R
Score-through#DDigital#SShadow#OOutline#
"
  230 ENDPROC
  240 :
  250 DEF PROCdisplay_screen
  260 PRINT TAB(18) FNprint("|C|U M e g
a F o n t   D e m o s t r a t i o n")
  270 PRINT TAB(21) FNprint("by |CClive
Whiston|C -- @ |CBBC Acorn User")
  280 PROCoscli("Fx20")
  290 line$=""
  300 REPEAT
  310 PRINT FNprint(line$)
  320 READ line$
  330 UNTIL line$="END"
  340 buffer$=fonts$
  350 PRINT TAB(5,7);
  360 FOR loop%=1 TO 14
  370 font$=LEFT$(buffer$,INSTR(buffer$,
"#")-1)
  380 buffer$=RIGHT$(buffer$,LEN(buffer$
)-LEN(font$)-1)
  390 PRINT FNprint("|"+font$);
  400 PRINT SPC(21-LEN(font$));
  410 NEXT
  420 VDU 19,1,7;0;
  430 REPEAT
  440 buffer$=fonts$
  450 FOR loop%=1 TO 14
  460 time%=TIME
  470 font$=LEFT$(buffer$,INSTR(buffer$,
"#")-1)
  480 buffer$=RIGHT$(buffer$,LEN(buffer$
)-LEN(font$)-1)
  490 PRINT TAB(0,30) FNprint("|"+font$)
;
  500 PRINT STRING$(21-LEN(font$)," ");
  510 PRINT FNprint("|"+LEFT$(font$,1)+"
ABCDEFGHIJKLMNOPQRSTUVWXYZ abcdefghijklm
nopqrstuvwxyz")
  520 PRINT TAB(20) FNprint("|"+LEFT$(fo
nt$,1)+"1234567890 !""#$%&'()=~||-^\@{}[
]`;:+*,./<>?");
  530 REPEAT
  540 UNTIL (TIME-time%)>=100 AND NOT IN
KEY(-99)
  550 NEXT
  560 UNTIL FALSE
  570 ENDPROC
  580 :
  590 DEF FNprint(A$)
  600 CALL (code+1),A$
  610 =CHR$0
  620 :
  630 DEF PROCoscli($command)
  640 A%=0
  650 X%=command MOD &100
  660 Y%=command DIV &100
  670 CALL oscli
  680 ENDPROC
  690 :
  700 DATA "|FWelcome to|F |CMegaFont|C|
F, a|F machine-code |Futility which incr
eases the number of fonts"
  710 DATA "|Favailable on|F BBC |Fand|F
 Master |Fseries computers from|F |OONE|
O |Fto|F |OFOURTEEN|O|F, containing"
  720 DATA "|Fan assortment of|F |Bstand
ard|B|F, |D|Fdynamic|D|F and |F|Iclassic
|F|I styles, consisting of:"
  730 DATA "|.|.|.|.|.|.|FAny number of
fonts can be combined to produce over|F
|Uone and a half thousand"
  740 DATA "|Fpossible style variations,
 with potential use of the subscript and
 superscript"
  750 DATA "|Ffonts for scientific and m
athematical formulae representation resp
ectively (eg."
  760 DATA "Glucose=C|-6|-H|-12|-O|-6|-
|Fand|F x|+n|+(x|+m|+)=x|+(n+m)|+|F)."
  770 DATA "|.|FSpecial attention has be
en applied to both underlining styles so
 that letters"
  780 DATA "|Fcontaining tails are not u
nderlined for a clearer finish (|Ueg. go
bbledygook|U and"
  790 DATA "|F|2gobbledygook|2).  The le
tter compression routines have also rece
ived additional"
  800 DATA "|Fprogramming to ensure that
 |Fa|F's look like |Fa|F's, |Fe|F's rese
mble |Fe|F's, and that |Ff|F's,"
  810 DATA "!|F's and |F?|F's are simila
r (ie. |Fa|-a|-|F,|F e|-e|-|F,|F f|-f|-|
F,|F !|-!|- |Fand|F ?|-?|-|F) even after
 size reduction."
  820 DATA "|.|FAs the utility code mani
pulates all the characters in real-time,
 any screen"
  830 DATA "|Fprintable character, wheth
er standard or user-defined, can be appr
opriately"
  840 DATA "|Fstyled with built-in, easy
-to-use control codes."
  850 DATA "|.|FBelow is displayed the s
tandard character set, cycling through t
he fourteen"
  860 DATA "|Fbasic fonts (which can be
paused by pressing the|F |CSpace-Bar|C|F
):"
  870 DATA "END"
```

Listing 5

```
   10 REM >Pattern (Info5)
   20 REM by Jan Vibe
   30 REM for 32-bit machines
   40 REM (c) BAU May 1992
   50 :
   60 ON ERROR PROCerr
   70 MODE 13
   80 MODE 141
   90 OFF
  100 k%=4
  110 DIM a%(k%,k%),c%(k%,8),p%(k%)
  120 r%=RND(-TIME)
  130 s1$="1"
  140 s2$="2"
  150 REPEAT
  160 t%=TIME+500
  170 FOR n%=0 TO k%
  180 FOR m%=0 TO k%
  190 a%(m%,n%)=RND(255)
  200 NEXT
  210 p%(n%)=RND(7)
  220 FOR m%=1 TO 8
  230 c%(n%,m%)=RND(256)-1
  240 NEXT
  250 NEXT
  260 OSCLI"FX112,"+s1$
  270 OSCLI"FX113,"+s2$
  280 SWAP s1$,s2$
  290 CLS
  300 PROCa(640,512,256,0,0,511)
  310 REPEAT UNTIL TIME>t%
  320 UNTIL FALSE
  330 :
  340 DEF PROCerr
  350 OSCLI"FX112,"+s1$
  360 REPORT
  370 PRINT" at line "STR$ERL
  380 ON
  390 END
  400 :
  410 DEF PROCa(x%,y%,z%,t%,v%,f%)
  420 IF (a%(t%,v%) AND 001)<>0 PROCb
  430 IF (a%(t%,v%) AND 002)<>0 PROCd
  440 IF (a%(t%,v%) AND 004)<>0 PROCx
  450 IF (a%(t%,v%) AND 008)<>0 PROCk
  460 IF (a%(t%,v%) AND 016)<>0 PROCr
  470 IF (a%(t%,v%) AND 032)<>0 PROCc
  480 IF (a%(t%,v%) AND 064)<>0 PROCs
  490 IF (a%(t%,v%) AND 128)<>0 PROCp
  500 IF t%<k% THEN
  510 IF (p%(t%) AND 1)<>0 THEN
  520 IF (f% AND 001)<>0 PROCa(x%,y%,z%/
2,t%+1,(v%+1) MOD k%,511)
  530 ENDIF
  540 IF (p%(t%) AND 2)<>0 THEN
  550 IF (f% AND 002)<>0 PROCa(x%-z%,y%-
z%,z%/2,t%+1,(v%+2) MOD k%,311)
  560 IF (f% AND 004)<>0 PROCa(x%-z%,y%+
z%,z%/2,t%+1,(v%+2) MOD k%,111)
  570 IF (f% AND 008)<>0 PROCa(x%+z%,y%+
z%,z%/2,t%+1,(v%+2) MOD k%,221)
  580 IF (f% AND 016)<>0 PROCa(x%+z%,y%-
z%,z%/2,t%+1,(v%+2) MOD k%,411)
  590 ENDIF
  600 IF (p%(t%) AND 4)<>0 THEN
  610 IF (f% AND 032)<>0 PROCa(x%-z%,y%,
z%/2,t%+1,(v%+3) MOD k%,39)
  620 IF (f% AND 064)<>0 PROCa(x%,y%+z%,
z%/2,t%+1,(v%+3) MOD k%,77)
  630 IF (f% AND 128)<>0 PROCa(x%+z%,y%,
z%/2,t%+1,(v%+3) MOD k%,153)
  640 IF (f% AND 256)<>0 PROCa(x%,y%-z%,
z%/2,t%+1,(v%+3) MOD k%,275)
  650 ENDIF
  660 ENDIF
  670 ENDPROC
  680 :
  690 DEF PROCb
  700 GCOL 3,c%(t%,1) MOD 64 TINT c%(t%,
1)
  710 RECTANGLE x%-z%,y%-z%,2*z%
  720 ENDPROC
  730 :
  740 DEF PROCd
  750 GCOL 3,c%(t%,2) MOD 64 TINT c%(t%,
2)
  760 MOVE x%-z%,y%
  770 DRAW x%,y%+z%:DRAWx%+z%,y%
  780 DRAW x%,y%-z%:DRAWx%-z%,y%
  790 ENDPROC
  800 :
  810 DEF PROCx
  820 GCOL 3,c%(t%,3) MOD 64 TINT c%(t%,
3)
  830 LINE x%-z%,y%-z%,x%+z%,y%+z%
  840 LINE x%+z%,y%-z%,x%-z%,y%+z%
  850 ENDPROC
  860 :
  870 DEF PROCk
  880 GCOL 3,c%(t%,4) MOD 64 TINT c%(t%,
4)
  890 LINE x%-z%,y%,x%+z%,y%
  900 LINE x%,y%-z%,x%,y%+z%
  910 ENDPROC
  920 :
  930 DEF PROCr
  940 GCOL 3,c%(t%,5) MOD 64 TINT c%(t%,
5)
  950 CIRCLE x%,y%,z%
  960 ENDPROC
  970 :
  980 DEF PROCc
  990 GCOL 3,c%(t%,6) MOD 64 TINT c%(t%,
6)
 1000 CIRCLE FILL x%,y%,z%
 1010 ENDPROC
 1020 :
 1030 DEF PROCs
 1040 GCOL 3,c%(t%,7) MOD 64 TINT c%(t%,
7)
 1050 RECTANGLE FILL x%-z%,y%-z%,2*z%
 1060 ENDPROC
 1070 :
 1080 DEF PROCp
 1090 GCOL 3,c%(t%,8) MOD 64 TINT c%(t%,
8)
 1100 MOVE x%,y%-z%
 1110 MOVE x%+z%,y%
 1120 PLOT &75,x%,y%+z%
```




```
1130 ENDPROC
```

Listing 6

```
10 REM >Maze (Info6)
20 REM Rambling maze
30 REM by Jan Vibe
40 REM for 32-bit machines
50 REM (c) BAU May 1992
60 :
70 MODE 0
80 COLOUR 0,0,0,255
90 DIM rx%(36),ry%(36)
100 c%=0
110 FOR n%=-12 TO 12 STEP 2
120 c%+=1
130 rx%(c%)=n%
140 ry%(c%)=-8
150 c%+=1
160 rx%(c%)=n%
170 ry%(c%)=8
180 NEXT
190 FOR n%=-8 TO 8 STEP 4
200 c%+=1
210 rx%(c%)=-8
220 ry%(c%)=n%
230 c%+=1
240 rx%(c%)=8
250 ry%(c%)=n%
260 NEXT
270 CIRCLE 640,512,64
280 VDU 5
290 MOVE 610,524
300 PRINT"Goal"
310 VDU 4
320 OFF
330 PROCa(400,512,RND(360))
340 ON:END
350 :
360 DEF PROCa(x%,y%,a%)
370 LOCAL x1%,y1%,a1%,d%,n%,m%,c%,t
380 FOR n%=1 TO 10
390 c%=0
400 d%=RND(7)+11
410 IF n%<=2 a1%=a%+45-RND(90) ELSE a1
%=RND(360)
420 t=RAD(a1%)
430 x1%=x%+d%*SIN(t)
440 y1%=y%+d%*COS(t)
450 FOR m%=1 TO 36
460 IF POINT(x1%+rx%(m%),y1%+ry%(m%))<
>0 c%=1:m%=36
470 NEXT
480 IF c%=0 THEN
490 LINE x%,y%,x1%,y1%
500 PROCa(x1%,y1%,a1%)
510 ENDIF
520 NEXT
530 ENDPROC
```

Listing 7

```
10 REM >Worms
20 REM by Jan Vibe
30 REM for 32-bit machines
40 REM (c) BAU May 1992
50 :
60 MODE 15
70 OFF
80 z%=12
90 k%=2*z%+12
100 st%=z%/4
110 IF st%<4 st%=4
120 DIM px(12),py(12),lx%(2000),ly%(20
00)
130 FOR n%=1 TO 12
140 t=RAD(30*n%)
150 px(n%)=(z%+8)*COS(t)
160 py(n%)=(z%+8)*SIN(t)
170 NEXT
180 PROCa(640,512,RND(360),RND(26),1)
190 ON
200 END
210 :
220 DEF PROCa(x%,y%,a%,f%,tp%)
230 LOCAL t,x1%,y1%,n%,c%,v%,w%
240 GCOL f%
250 CIRCLE FILL x%,y%,z%
260 lx%(tp%)=x%
270 ly%(tp%)=y%
280 v%=a%-15+RND(30)
290 t=RAD(v%)
300 IF POINT(x%+k%*SIN(t),y%+k%*COS(t)
)=0 THEN
310 FOR n%=1 TO 12
320 w%=POINT(x%+px(n%),y%+py(n%))
330 IF w%=0 OR w%=f% c%+=1
340 NEXT
350 IF c%=12 PROCa(x%+st%*SIN(t),y%+st
%*COS(t),v%,f%,tp%+1)
360 ENDIF
370 IF POINT(x%,y%)=f% THEN
380 FOR w%=0 TO 7
390 t=(7-w%)*z%/7
400 PROCf(f%,w%)
410 FOR n%=1 TO tp%
420 CIRCLE FILL lx%(n%),ly%(n%),t
430 NEXT
440 NEXT
450 ENDIF
460 v%=a%+90
470 c%=0
480 t=RAD(v%)
490 x1%=x%+k%*SIN(t)
500 y1%=y%+k%*COS(t)
510 IF POINT(x1%,y1%)=0 THEN
520 FOR n%=1 TO 12
530 c%+=POINT(x1%+px(n%),y1%+py(n%))
540 NEXT
550 IF c%=0 PROCa(x%+k%*SIN(t),y%+k%*C
OS(t),v%,RND(26),1)
560 ENDIF
570 v%=a%-90
580 c%=0
590 t=RAD(v%)
600 x1%=x%+k%*SIN(t)
610 y1%=y%+k%*COS(t)
620 IF POINT(x1%,y1%)=0 THEN
630 FOR n%=1 TO 12
640 c%+=POINT(x1%+px(n%),y1%+py(n%))
650 NEXT
660 IF c%=0 PROCa(x%+k%*SIN(t),y%+k%*C
OS(t),v%,RND(26),1)
670 ENDIF
680 ENDPROC
690 :
700 DEF PROCf(f%,i%)
710 LOCAL r%,g%,b%
720 b%=f% DIV 9
730 f%=f% MOD 9
740 g%=f% DIV 3
750 f%=f% MOD 3
760 r%=f%
770 f%=r%+4*g%+16*b%
780 IF i%>=4 f%+=&15
790 GCOL f% TINT (64*i%) MOD 256
800 ENDPROC
```

Listing 8

```
10 REM >3DWave (Info8)
20 REM by Jan Vlietinck
30 REM for 32-bit machines
40 REM (c) BAU May 1992
50 :
60 DIM q% 400000
70 MODE 13
80 damp=8
90 po=6
100 dm=2^po
110 i=0:j=1:t=2
120 o=3:v=4:w=5
130 x=6:y=7:scr=8
140 col=9:tab1=10:tab2=11
150 sp=13:link=14:pc=15
160 z=5
170 FOR pass=0 TO 2 STEP 2
180 P%=q%
190 [OPT pass
200 .scr1   EQUD    148
210         EQUD    -1
220 .scr2   EQUD    0
230 .ta1    EQUD    xtab
240 .ta2    EQUD    xtab+dm*dm*8
250 .ex     EQUD    dm/2
260 .ey     EQUD    dm/2
270 .mo     EQUD    1
280
290 .start  STMFD   (sp)!,{link}
300 .loop   MOV     r0,#&70
310         LDR     r1,mo
320         SWI     "OS_Byte"
330         MOV     r0,#16
340         SWI     "OS_WriteC"
350         BL      wave
360         MOV     r0,#&13
370         SWI     "OS_Byte"
380         LDR     r1,mo
390         EOR     r0,r1,#3
400         STR     r0,mo
410         MOV     r0,#&71
420         SWI     "OS_Byte"
430         SWI     "OS_ReadEscapeStat
e"
440         BCC     loop
450         LDMFD   (sp)!,{pc}
460
470 .wave   ADR     r0,scr1
480         ADR     r1,scr2
490         SWI     "OS_ReadVduVariabl
es"
500         LDR     scr,scr2
510         LDR     tab1,ta1
520         LDR     tab2,ta2
530         STR     tab1,ta2
540         STR     tab2,ta1
550 .mo     SWI     "OS_Mouse"
560         CMP     t,#0
570         BEQ     sk
580         MOV     t,i,LSR #(10-po)
590         STR     t,ex
600         MOV     t,j,LSR #(10-po)
610         STR     t,ey
620         MOV     j,#100
630         ADD     j,j,#512
640 .sk     LDR     x,ex
650         LDR     y,ey
660         MOV     t,x,LSL #3
670         ADD     t,t,y,LSL #3+po
680         ADD     t,t,#4
690         RSB     j,j,#512
700         MOV     j,j,LSL #16
710         STR     j,[tab1,t]
720         MOV     i,#0
730 .rand   ADD     w,tab1,i,LSL #3
740         LDR     t,[w,#+dm*8]
750         STR     t,[w]
760         ADD     w,tab1,i,LSL #3
770         ADD     w,w,#(dm-1)*8*dm
780         LDR     t,[w,#-dm*8]
790         STR     t,[w]
800         ADD     w,tab1,i,LSL #3+po
810         LDR     t,[w,#8]
820         STR     t,[w]
830         ADD     w,tab1,i,LSL #3+po
840         ADD     w,w,#(dm-1)*8
850         LDR     t,[w,#-8]
860         STR     t,[w]
870         ADD     i,i,#1
880         CMP     i,#dm
890         BNE     rand
900         MOV     j,#1
910         ADD     tab1,tab1,#1<<(3+p
o)
920         ADD     tab2,tab2,#1<<(3+p
o)
930 .lo1    MOV     i,#1
940         ADD     tab1,tab1,#1<<3
950         ADD     tab2,tab2,#1<<3
960         MOV     x,j,LSL #(7-po)
970         RSB     x,x,#372
980         MOV     z,j,LSL #(7-po)
990         ADD     z,z,#100
1000 .lo2   LDR     o,[tab1,#-8]
1010        LDR     t,[tab1,#+8]
1020        ADD     o,o,t
1030        LDR     t,[tab1,#-dm*8]
1040        ADD     o,o,t
1050        LDR     t,[tab1,#+dm*8]
1060        ADD     o,o,t
1070        LDMIA   (tab1)!,{t,v}
1080        SUB     o,o,t,LSL #2
1090        ADD     v,v,o,ASR #2
1100        SUB     t,t,t,ASR #damp
1110        ADD     t,t,v
1120        STMIA   (tab2)!,{t,v}
1130        MOV     col,t,ASR #18
1140        ADD     col,col,#100
1150        ORR     col,col,#3
1160        SUB     x,x,#1<<(8-po)
1170        ADD     y,z,t,ASR #20
1180        ADD     t,y,y,LSL #2
1190        ADD     t,x,t,LSL #6
1200        CMP     t,#320*256
1210        STRLOB  col,[scr,t]
1220        ADD     i,i,#1
1230        CMP     i,#(dm-1)
1240        BNE     lo2
1250        ADD     tab1,tab1,#1<<3
1260        ADD     tab2,tab2,#1<<3
1270        ADD     j,j,#1
1280        CMP     j,#(dm-1)
1290        BNE     lo1
1300        MOV     pc,link
1310
1320 .vul   ADR     w,xtab
1330        MOV     i,#dm*dm*2*2
1340        MOV     v,#0
1350 .lop   STMIA   (w)!,{v}
1360        SUBS    i,i,#1
1370        BNE     lop
1380        MOV     pc,link
1390
1400 .xtab
1410 ]
1420 NEXT
1430 CALL vul
1440 ORIGIN 0,0
1450 OFF
1460 *Pointer
1470 MOUSE ON
1480 MOUSE RECTANGLE 0,0,1024,1024
1490 CALL start
1500 END
```

Listing 9

```
10 REM >InputLib (Info9)
20 REM Input routine library
30 REM by Dave Acton
40 REM for 8-bit machines
50 REM (c) BAU May 1992
60 :
70 DEF PROCinp_init
80 DIM inp_valid% 32
90 PROCinp_valid("@")
100 ENDPROC
110 :
120 DEF PROCinp_valid(v$)
130 inp_dvalid$=v$
140 ENDPROC
150 :
160 DEF FNinp_float(x%,y%,size%,sug,mi
n,max,dec%)
170 LOCAL v,v$,ok%,sug$,i%
180 IF sug=0 sug$="" ELSE sug$=STR$(su
g)
190 REPEAT
200 REPEAT
210 v$=FNinp_main(x%,y%,size%,sug$,9,"
0123456789.","",dec%)
220 UNTIL LEN(v$)>1
230 v=EVAL(v$)
240 IF min>max THEN ok%=TRUE ELSE ok%=
(v>=min AND v<=max)
250 UNTIL ok%
260 =v
270 :
280 DEF FNinp_int(x%,y%,size%,sug%,min
,max)
290 LOCAL sug$
300 IF sug%=0 sug$="" ELSE sug$=STR$(s
ug%)
310 =FNinp_num(x%,y%,size%,sug$,min,ma
x,"0123456789-","")
320 :
330 DEF FNinp_hex(x%,y%,size%,sug%,min
,max)
340 LOCAL sug$
350 IF sug%=0 sug$="" ELSE sug$=STR$~(
sug%)
360 =FNinp_num(x%,y%,size%,sug$,min,ma
x,"0123456789ABCDEF","&")
370 :
380 DEF FNinp_num(x%,y%,size%,sug$,min
,max,valid$,h$)
390 LOCAL v%,v$,ok%
400 REPEAT
410 REPEAT
420 v$=FNinp_main(x%,y%,size%,sug$,9,v
alid$,h$,0)
430 UNTIL LEN(v$)>1
440 v%=EVAL(v$)
450 IF min>max THEN ok%=TRUE ELSE ok%=
(v%>=min AND v%<=max)
460 UNTIL ok%
470 =v%
480 :
490 DEF FNinp_string(x%,y%,size%,sug$,
len%)
500 =FNinp_vstring(x%,y%,size%,sug$,le
n%,"@")
510 :
520 DEF FNinp_vstring(x%,y%,size%,sug$
,len%,valid$)
530 =FNinp_main(x%,y%,size%,sug$,len%,
valid$,"",255)
540 :
550 DEF FNinp_main(x%,y%,size%,sug$,le
n%,valid$,h$,dec%)
560 LOCAL ans$,p%,v%,i%,set%,key%,swap
%,c%,h%,A%,X%
570 A%=4
580 X%=1
590 X%=(USR(&FFF4) AND &FF00) DIV 256
600 sug$=LEFT$(sug$,len%)
610 ans$=h$
620 h%=LEN(h$)
630 p%=LEN(sug$)
640 IF valid$="" THEN valid$=inp_dvali
d$
650 FOR i%=0 TO 31
660 inp_valid%?i%=0
670 NEXT
680 set%=TRUE
690 swap%=FALSE
700 REPEAT
710 c%=ASC(valid$)
720 valid$=MID$(valid$,2)
730 i%=INSTR(" ~@^\",CHR$(c%))
740 IF i%>1 THEN c%=-i%
750 IF c%=-5 c%=ASC(valid$):valid$=MID
$(valid$,2)
760 IF c%=-2 set%=NOT set%
770 IF c%=-3 THEN FOR i%=4 TO 31:inp_v
alid%?i%=set%:NEXT:set%=TRUE
780 IF c%=-4 THEN swap%=TRUE
790 IF c%>0 THEN PROCinp_make_valid(c%
,set%):set%=TRUE
800 UNTIL valid$=""
810 PROCinp_make_valid(127,FALSE)
820 FOR i%=135 TO 139
830 PROCinp_make_valid(i%,FALSE)
840 NEXT
850 v%=0
860 REPEAT
870 i%=INSTR(ans$,".")
880 IF i%>0 AND LEN(ans$)>i%+dec% ans$
=LEFT$(ans$,i%+dec%)
890 IF p%<0 p%=0 ELSE IF p%>LEN(ans$)
p%=LEN(ans$)
900 IF v%<p%-size%+1 v%=p%-size%+1
910 IF v%>p% v%=p%
920 IF sug$<>"" key%=ASC(sug$):sug$=MI
D$(sug$,2) ELSE key%=-1
930 FOR i%=1 TO 2
940 IF sug$="" PRINTTAB(x%,y%)MID$(ans
$+STRING$(size%," "),v%+1,size%);:IF i%=
1 PRINTTAB(x%-v%+p%,y%)"?";
950 IF key%<0 THEN key%=INKEY(30)
960 NEXT
970 IF swap% AND (key%>=97 AND key%<=1
22) key%=key%-32
980 IF key%=4 ans$=LEFT$(ans$,p%)
990 IF key%=21 ans$=LEFT$(ans$,h%):v%=
0
1000 IF key%=127 AND p%>h% ans$=LEFT$(a
ns$,p%-1)+MID$(ans$,p%+1):p%=p%-1
1010 IF key%=135 AND p%>=h% ans$=LEFT$(
ans$,p%)+MID$(ans$,p%+2)
1020 IF key%=136 PROCinp_move_curs(-1)
1030 IF key%=137 PROCinp_move_curs(1)
1040 IF FNinp_valid(key%) AND LEN(ans$)
<len% AND p%>=h% ans$=LEFT$(ans$,p%)+CHR
$(key%)+MID$(ans$,p%+1):p%=p%+1
1050 UNTIL key%=13 OR key%=10
1060 CALL &FFF4
1070 =ans$
1080 :
1090 DEF PROCinp_make_valid(c%,v%)
1100 LOCAL a%
1110 a%=inp_valid%+c%/8
1120 IF v% THEN ?a%=?a% OR (2^(c% MOD 8
)) ELSE ?a%=?a% AND NOT (2^(c% MOD 8))
1130 ENDPROC
1140 :
1150 DEF PROCinp_move_curs(d%)
1160 IF INKEY-2 THEN d%=d%*256 ELSE IF
INKEY-1 THEN d%=d%*(size%-1)
1170 p%=p%+d%
1180 ENDPROC
1190 :
1200 DEF FNinp_valid(c%)
1210 IF c%<32 THEN =FALSE ELSE =((inp_v
alid%?(c%/8)) AND (2^(c% MOD 8)))>0
```

Listing 10

```
10 REM >InputDemo (Info10)
20 REM InputLib demo
30 REM by Dave Acton
40 REM for 8-bit machines
50 REM (c) BAU May 1992
60 :
70 MODE 0
80 VDU 23;8202;0;0;0;
```

```
90 PROCinp_init
100 PRINTTAB(0,0)"Enter an integer between 4 and 40 (e.g. 15)"
110 ans%=FNinp_int(4,2,10,15,4,40)
120 PRINTTAB(0,2)"You entered ";ans%
130 PRINTTAB(0,4)"Enter a hex number between &1111 and &2222 (e.g. &1234)"
140 ans%=FNinp_hex(4,6,10,&1234,&1111,&2222)
150 PRINTTAB(0,6)"You entered &";~ans%
160 PRINTTAB(0,8)"Enter your name (e.g. Norman)"
170 ans$=FNinp_string(4,10,10,"Norman",20)
180 PRINTTAB(0,10)"Your name is apparently "ans$
190 PRINTTAB(0,12)"Enter a decimal number between 0.00 and 0.99 (e.g. 0.5)"
200 ans=FNinp_float(4,14,10,0.50,0.00,0.99,2)
210 PRINTTAB(0,14)"You entered ";ans
220 PRINTTAB(0,16)"Enter a word that only contains consonants (e.g. RHYTHM)"
230 ans$=FNinp_vstring(4,18,10,"rhythm",20,"@^~A~E~I~O~U")
240 PRINTTAB(0,18)"You entered ";ans$
250 END
260 :
270 REM Append InputLib here...
```

Listing 11

```
10 REM >TrigProg (Info11)
20 :
30 B=0:C=112:D=1280:E=1:F=2:L=0:SYS26,64,64:MODE0:ORIGIN640,512:REPEAT:SYS6,113,E:SYS6,112,F:SWAPE,F:WAIT:CLS:B+=.05:A=B+L:REPEAT:G=L*(SINA):H=L*(COSA):CIRCLEG^3*H*350,H*G*350,H*50:PLOT65,G^5*H^3*D,H*C:PLOT65,G^5*G^2*D,H*C:CIRCLEG^3*580,H*450,H*20:A+=(PI*2)/12:UNTIL A>B+(PI*2):IF L<1 L+=0.01:UNTIL0 ELSE UNTIL0
```

Listing 12

```
10 REM >BlancMange (Info12)
20 :
30 MODE0:Y2$="0":Y2=0:L=640:FORN=1TO10:MOVE0,0:CLS:Y$="-ABS(X MOD"+STR$(L/2^(N-1))+"-"+STR$(L/2^N)+")":FORX=1TO L:Y=EVALY$+(L/(2^N))+EVAL(Y2$)+Y2:DRAWX*(1280/L),Y*1024/L:NEXT:Y2$=Y2$+Y$:Y2=Y2+(L/(2^N)):W=INKEY(100):NEXT
```

Listing 13

```
10 REM >Waves (Info13)
20 :
30 MODE0:E=0:F=0:G=0:H=0:REPEAT:A=400:B=100:C=-400:D=-100:I=0:J=0:K=0:L=0:M=RND(1)/50:N=RND(1)/50:O=RND(1)/50:P=RND(1)/50:VDU23;8202;0;0;0;29,640;100;:REPEAT:I=I-A*M:J=J-B*N:K=K-C*O:L=L-D*P:A=A+I:B=B+J:C=C+K:D=D+L:MOVEE,F+32:DRAWA,B:DRAWC,D:DRAWG,H+32:E=A:F=B:G=C:H=D:PRINT:OSCLI"*FX19":UNTILINKEY-99:UNTIL0
```

Listing 14

```
10 REM >MakeSp (Info14)
20 REM Make !sBasic sprite & !Run
30 REM Sprites by Barry Wickett
40 REM for 32-bit machines
50 REM (c) BAU May 1992
60 :
70 DIM w% 800
80 READ load%,exec%,olen%,attrib%
90 p%=0
100 d$=""
110 dl%=470
120 WHILE p%<olen%
130 b%=FNb
140 IF b%=130:p%?w%=FNb:p%+=1
150 IF b%>=131 AND b%<=162 THEN
160 n%=b%-128
170 f%=p%-FNb
180 FOR i%=0 TO n%-1
190 ?(w%+p%+i%)=?(w%+f%+i%)
200 NEXT
210 p%+=n%
220 ENDIF
230 IF b%<130 OR b%>162 THEN p%?w%=b%:p%+=1
240 ENDWHILE
250 SYS "OS_File",0,"!Sprites",,,w%,w%+p%
260 SYS "OS_File",1,"!Sprites",load%,exec%,,attrib%
270 PRINT"Sprite file created"
280 :
290 runfile%=OPENOUT "!Run"
300 BPUT #runfile%,"Set sBASIC$Dir <Obey$Dir>"
310 BPUT #runfile%,"WimpSlot -min 32k -max 32k"
320 BPUT #runfile%,"Run <sBASIC$Dir>.!RunImage"
330 CLOSE #runfile%
340 *Settype !Run Obey
350 END
360 :
370 DEF FNb
380 LOCAL b%,c1%,c2%,i%
390 IF d$="" THEN
400 READ d$,c1%
410 c2%=0
420 FOR i%=1 TO LEN(d$)/2
430 c2%+=EVAL("&"+MID$(d$,2*i%-1,2))
440 NEXT
450 IF c1%<>(c2% MOD 100) PRINT"Error in DATA line ";dl%:END
460 dl%+=10
470 ENDIF
480 b%=EVAL("&"+LEFT$(d$,2))
490 d$=MID$(d$,3)
500 =b%
510 :
520 DATA &FFFFF943,&9B84E5AD
530 DATA &2E0,&3
540 DATA 01000000108304E4020000,82
550 DATA D48304217362617369638340,40
560 DATA 16000004871C840D078328,12
570 DATA 2C832C8083310C83347777,60
580 DATA 7777830483078400828882,52
590 DATA 8878860782888288830483,95
600 DATA 1C70828782888288007085,82
610 DATA 1B0080008080841477077 7,8
620 DATA 828790288C430080080089,29
630 DATA 14863C8850866F89500085,25
640 DATA 148384078F288B3C8AA177,90
650 DATA 070787A70000B0BB828B82,78
660 DATA 88BBBB0B00BB00B00B08B7,86
670 DATA 8614BBBBBB7083047B8308,24
680 DATA 828BBBBB86DCBB77BB7883,41
690 DATA 128414FB8914BB83169028,2
700 DATA 8814B7B70B863C00843C70,31
710 DATA BBB78D147085148450EB88,79
720 DATA 2885648468836CB77B85A0,47
730 DATA FFFFFFFF8304FFFF83FC83,79
740 DATA FF8B119314992887409014,34
750 DATA 84558F50F09314FFFF0FA2,34
760 DATA 2884A08327886B88AF88B4,72
770 DATA 855B0F854BFF00F0865084,88
780 DATA DF830E839F00FF0F87648C,3
790 DATA 1488788756853CF08F3C83,64
800 DATA 4B9114855693648778FF,16
```

Listing 15

```
10 REM >!RunImage (Info15)
20 REM Desktop front end for !sBasic
30 REM by Barry Wickett
40 REM for 32-bit machines
50 REM (c) BAU May 1992
60 :
70 PROCinit
80 ON ERROR PROCerror
90 REPEAT
100 !blk%=%1111110110111111
110 SYS "Wimp_Poll",0,blk% TO reason%
120 IF reason% THEN
130 CASE reason% OF
140 WHEN 6    :PROCclick(!blk%,blk%!8,blk%!8,blk%!12,blk%!16)
150 WHEN 9    :PROCselectmenu(!blk%)
160 WHEN 17,18:PROCmessage(blk%!16)
170 ENDCASE
180 ENDIF
190 UNTIL end%
200 SYS "Wimp_CloseDown",mytask%,!task%
210 END
220 :
230 DEF PROCclick(mx%,my%,but%,wind%,icon%)
240 IF but%=2 AND wind%=-2 AND icon%=myicon% THEN SYS "Wimp_CreateMenu",,menu%,mx%-64,my%+140
250 ENDPROC
260 :
270 DEF PROCinit
280 program$="simple BASIC compiler"
290 DIM task% 5
300 $task%="TASK"
310 SYS "Wimp_Initialise",200,!task%,program$ TO ,mytask%
320 DIM blk% 1000,menu% &100
330 end%=FALSE
340 myicon%=FNcreate_icon("!sbasic",-1,0,0,68,68,&2102,1)
350 PROCcrmenu
360 ENDPROC
370 :
380 DEF PROCload(file$)
390 SYS "OS_CLI","Set Compile$ "+file$
400 $blk%="BASIC <sBASIC$Dir>.compile"
410 SYS "Wimp_StartTask",blk%
420 ENDPROC
430 :
440 DEF PROCselectmenu(item%)
450 SYS "Wimp_CreateMenu",,-1
460 IF item%=0 THEN end%=TRUE
470 ENDPROC
480 :
490 DEF PROCcrmenu
500 $menu%="sBASIC"
510 menu%!12=&70207
520 menu%!16=128
530 menu%!20=44
540 menu%!24=0
550 menu%!28=&80
560 menu%!32=0
570 menu%!36=(7<<24) OR %11001
580 $(menu%+40)="Quit"
590 ENDPROC
600 :
610 DEF PROCack
620 send%=blk%!4
630 ref%=blk%!8
640 SYS "Wimp_GetPointerInfo",,blk%+8
650 blk%!28=blk%!8
660 blk%!32=blk%!12
670 !blk%=(48+LENfile$) AND NOT 3
680 blk%!12=ref%
690 blk%!16=4
700 blk%!36=-1
710 blk%!40=&FFF
720 $(blk%+44)=file$+CHR$0
730 SYS "Wimp_SendMessage",17,blk%,send%
740 ENDPROC
750 :
760 DEF PROCmessage(mess%)
770 CASE mess% OF
780 WHEN 0:end%=TRUE
790 WHEN 1:
800 !blk%=64
810 blk%!12=blk%!8
820 blk%!16=2
830 blk%!36=-1
840 $(blk%+44)="<Wimp$Scrap>"+CHR$0
850 SYS "Wimp_SendMessage",17,blk%,blk%!4
860 WHEN 3:
870 IF blk%!40=&FFF THEN
880 file$=FNst(blk%+44)
890 PROCack
900 PROCload(file$)
910 ELSE
920 PROCwarn("only text files please")
930 ENDIF
940 ENDCASE
950 ENDPROC
960 :
970 DEF FNst(p%)
980 s$=""
990 WHILE ?p%<>0
1000 s$+=CHR$(?p%)
1010 p%+=1
1020 ENDWHILE
1030 =s$
1040 :
1050 DEF FNcreate_icon(name$,!blk%,blk%!4,blk%!8,blk%!12,blk%!16,blk%!20,blk%!28)
1060 len%=LENname$
1070 DIM blk%!24 len%
1080 $(blk%!24)=name$
1090 blk%!32=len%
1100 SYS "Wimp_CreateIcon",,blk% TO icon%
1110 =icon%
1120 :
1130 DEF PROCwarn(text$)
1140 SYS "Wimp_DragBox",,0
1150 !blk%=0
1160 $(blk%+4)=text$+CHR$0
1170 SYS "Wimp_ReportError",blk%,1,program$
1180 ENDPROC
1190 :
1200 DEF PROCerror
1210 SYS "Wimp_DragBox",,0
1220 !blk%=ERR
1230 $(blk%+4)="Fatal error {"+REPORT$+"} has occured and must exit"+CHR$0
1240 SYS "Wimp_ReportError",blk%,1,program$
1250 SYS "Wimp_CloseDown",mytask%,!task%
1260 END
```

Listing 16

```
10 REM >Compile (Info16)
20 REM !sBasic Compiler
30 REM by Barry Wickett
40 REM for 32-bit machines
50 REM (c) BAU May 1992
60 :
70 ON ERROR PROCerror(REPORT$)
80 PROCinitvars
90 PROCcompile
100 END
110 :
120 DEF PROCinitvars
130 MODE 0
140 maxvars=20
150 unknown=0
160 var=1:if=2:then=3:while=4:endwhile=5
170 eq=6:lt=7:gt=8:le=9:ge=10:ne=11
180 sub=12:add=13:mul=14:div=15:ob=16:cb=17
190 neg=18:and=19:or=20:eor=21:not=22:colon=23
200 newline=24:constant=25:print=26:semicolon=27
210 array=28:endif=29:end=30:plot=31:comma=32:vdu=33
220 keywords=33:vars=0:maxs=100:bras=0:consts=0:maxconst=100:divflag=FALSE
230 maxrec=5:rec=0:last=FALSE
240 DIM keyword$(keywords),var$(maxvars),order(11)
250 DIM stack1(maxrec,maxs),stack2(maxrec,maxs),const(maxconst),stp(maxrec)
260 order()=2.1,3,3,4,5,6,2,5.5,5.4,5.4,5.4,5.4
270 keyword$()="","<variable>","IF","THEN","WHILE","ENDWHILE","=","<",">","<=",">=","<>","-","+","*","/","(",")","<neg>","AND","OR","EOR","NOT",":",CHR$13,"<constant>","PRINT",";","ARRAY(","ENDIF","END","PLOT",",","VDU"
280 ENDPROC
290 :
300 DEF PROCcompile
310 infile$="<compile$>"
320 infile=OPENIN(infile$)
330 IF infile=0 THEN PROCerror("Cannot open "+infile$)
340 outfile=OPENOUT("<sBASIC$Dir>.temp")
350 PROCout("PRINT'""Compiling...""")
360 PROCout("DIM code% 100000")
370 PROCout("val1=0:val2=1:ans=2:true=3:shift=4:one=5:neg=6:return=7:array=8:apos=9:pbuf=4:const=5:var=6")
380 PROCout("FOR pass=0 TO 2 STEP 2")
390 PROCout("P%=code%")
400 PROCout("[OPT pass")
410 PROCout("MOV return,R14")
420 PROCout("MOV one,#1")
430 PROCout("MVN true,#0")
440 PROCout("LDR array,buf")
450 PROCout("LDR pbuf,buf+4")
460 PROCout("LDR const,buf+8")
470 PROCout("LDR var,buf+12")
480 PROCout("B start")
490 PROCout(".buf")
500 PROCout("EQUD array%")
510 PROCout("EQUD printbuffer")
520 PROCout("EQUD constant")
530 PROCout("EQUD variable")
540 PROCout(".start")
550 endcomp=FALSE:lastword=unknown:thisword=unknown
560 line$=""
570 WHILE NOT endcomp
580 PROCnewline
590 ENDWHILE
600 PROCout("MOV PC,return")
610 IF divflag THEN
620 divfile=OPENIN"<sBASIC$Dir>.divmc"
630 WHILE NOTEOF#divfile
640 BPUT#outfile,BGET#divfile
650 ENDWHILE
660 CLOSE#divfile
670 ENDIF
680 PROCout(".printbuffer EQUS STRING$(16,CHR$32)")
690 PROCout(".variable")
700 FOR v=1 TO vars
710 PROCout("EQUD 0")
720 NEXT v
730 PROCout(".constant")
740 IF consts>0 THEN
750 FOR c=1 TO consts
760 PROCout("EQUD "+STR$(const(c)))
770 NEXT c
780 ENDIF
790 PROCout(".array%"):REM must be last line to be assembled
800 PROCout("]")
810 PROCout("NEXT pass")
820 PROCout("PRINT'""Executing...""'")
830 PROCout("CALL code%")
840 CLOSE#outfile
850 CLOSE#infile
860 PRINT'
870 *BASIC <sBASIC$Dir>.temp
880 ENDPROC
890 :
900 DEF PROCout(st$)
910 BPUT#outfile,st$
920 ENDPROC
930 :
940 DEF PROCnewline
950 sl=TRUE
960 IF line$="" THEN
970 WHILE line$="" AND NOT EOF#infile
980 line$=FNstripspaces(GET$#infile)
990 ENDWHILE
1000 IF EOF#infile AND line$="" THEN line$="END"
1010 line$+=CHR$13
1020 ENDIF
1030 PROCstartline(line$)
1040 ENDPROC
1050 :
1060 DEF PROCstartline(RETURN line$)
1070 thisword=unknown
1080 WHILE thisword<>newline AND NOTendcomp AND thisword<>endwhile AND thisword<>endif
1090 line$=FNstripword(line$)
1100 error=FALSE
1110 CASE thisword OF
1120 WHEN if        :PROCif
1130 WHEN while     :PROCwhile
1140 WHEN end       :PROCend
1150 WHEN var       :PROCassign
1160 WHEN newline   :
1170 WHEN endwhile  :
1180 WHEN endif     :
1190 WHEN colon     :sl=TRUE
1200 WHEN print     :PROCprint
1210 WHEN semicolon:
1220 WHEN array     :PROCarray
1230 WHEN plot      :PROCplot
1240 WHEN vdu       :PROCvdu
1250 OTHERWISE
1260 error=TRUE
1270 ENDCASE
1280 IF error THEN PROCerror("Syntax Error")
1290 ENDWHILE
1300 ENDPROC
1310 :
1320 DEF PROCvdu
1330 REPEAT
1340 IF FNword(line$)=comma OR FNword(line$)=semicolon THEN line$=FNstripword(line$)
1350 IF nextword<>colon AND nextword<>newline THEN
1360 PROCeq(line$)
1370 IF FNword(line$)=semicolon THEN
1380 PROCout("AND R0,ans,#255")
1390 PROCout("SWI ""OS_WriteC""")
1400 PROCout("MOV R0,ans,ASR#8")
1410 PROCout("SWI ""OS_WriteC""")
1420 ELSE
```

```
1430 PROCout("MOV R0,ans")
1440 PROCout("SWI ""OS_WriteC""")
1450 ENDIF
1460 ENDIF
1470 UNTIL FNword(line$)<>comma AND FNword(line$)<>semicolon
1480 ENDPROC
1490 :
1500 DEF PROCarray
1510 PROCarraynum(line$)
1520 PROCout("MOV apos,ans")
1530 line$=FNstripword(line$)
1540 IF thisword<>eq THEN PROCerror("'=' Expected")
1550 PROCeq(line$)
1560 PROCout("STR ans,[array,apos,ASL#2]")
1570 ENDPROC
1580 :
1590 DEF PROCplot
1600 PROCeq(line$)
1610 PROCout("STMFD R13!,{ans}")
1620 IF FNword(line$)<>comma THEN PROCerror("Syntax Error")
1630 line$=FNstripword(line$)
1640 PROCeq(line$)
1650 PROCout("STMFD R13!,{ans}")
1660 IF FNword(line$)<>comma THEN PROCerror("Syntax Error")
1670 line$=FNstripword(line$)
1680 PROCeq(line$)
1690 PROCout("LDMFD R13!,{R1}")
1700 PROCout("LDMFD R13!,{R0}")
1710 PROCout("SWI ""OS_Plot""")
1720 ENDPROC
1730 :
1740 DEF PROCarraynum(RETURN line$)
1750 LOCAL arrayline$,al
1760 al=0:br=0
1770 WHILE al<LENline$ AND br>=0
1780 al+=1
1790 IF MID$(line$,al,1)="(" THEN br+=1
1800 IF MID$(line$,al,1)=")" THEN br-=1
1810 ENDWHILE
1820 IF br>=0 THEN PROCerror("Unmatched ()")
1830 arrayline$="("+LEFT$(line$,al)
1840 PROCeq(arrayline$)
1850 line$=MID$(line$,al+1)
1860 ENDPROC
1870 :
1880 DEF PROCprint
1890 PROCeq(line$)
1900 PROCout("MOV R0,ans")
1910 PROCout("MOV R1,pbuf")
1920 PROCout("MOV R2,#16")
1930 PROCout("SWI ""OS_ConvertInteger4""")
1940 PROCout("SWI ""OS_Write0""")
1950 IF FNword(line$)<>semicolon THEN
1960 PROCout("SWI ""OS_NewLine""")
1970 ELSE
1980 PROCout("SWI 256+32")
1990 ENDIF
2000 ENDPROC
2010 :
2020 DEF PROCassign
2030 assignvar=varnum
2040 line$=FNstripword(line$)
2050 IF thisword<>eq THEN PROCerror("'=' Expected")
2060 thisword=unknown
2070 PROCeq(line$)
2080 PROCout("STR ans,[var,#"+STR$((assignvar-1)<<2)+"]")
2090 ENDPROC
2100 :
2110 DEF PROCwhile
2120 LOCAL wbra,ebra
2130 wbra=bras+1
2140 ebra=bras+2
2150 bras+=2
2160 PROCout(".while"+STR$(wbra))
2170 PROCeq(line$)
2180 PROCout("CMP ans,#0")
2190 PROCout("BLEQ endwhile"+STR$(ebra))
2200 WHILE thisword<>endwhile
2210 PROCnewline
2220 ENDWHILE
2230 PROCout("BL while"+STR$(wbra))
2240 PROCout(".endwhile"+STR$(ebra))
2250 PROCnewline
2260 ENDPROC
2270 :
2280 DEF PROCif
2290 LOCAL ifbra
2300 PROCeq(line$)
2310 bras+=1
2320 ifbra=bras
2330 line$=FNstripword(line$)
2340 IF thisword<>then THEN PROCerror("THEN expected")
2350 PROCout("CMP ans,#0")
2360 PROCout("BLEQ endif"+STR$(ifbra))
2370 IF nextword<>newline THEN
2380 sl=TRUE
2390 PROCstartline(line$)
2400 ELSE
2410 WHILE thisword<>endif
2420 PROCnewline
2430 ENDWHILE
2440 ENDIF
2450 PROCout(".endif"+STR$(ifbra))
2460 PROCnewline
2470 ENDPROC
2480 :
2490 DEF PROCeq(RETURN line$)
2500 rec+=1
2510 IF rec>maxrec THEN PROCerror("Too many recursions")
2520 LOCAL eq$
2530 stp(rec)=0
2540 eq$=""
2550 WHILE FNeqword(FNword(line$))
2560 line$=FNstripword(line$)
2570 IF NOTFNeqword(lastword) AND NOTFNeqword(nextword) THEN last=TRUE
2580 IF lastword<>var AND lastword<>constant AND lastword<>array AND thisword=sub AND (nextword=var OR nextword=constant OR nextword=array OR nextword=ob) THEN thisword=neg
2590 CASE thisword OF
2600 WHEN var,constant,array:PROCpolish(thisword,word$)
2610 WHEN eq,lt,gt,le,ge,ne:PROCpush(thisword,order(0))
2620 WHEN sub,add,mul,div,cb,ob,neg,and,or,eor,not:PROCpush(thisword,order(thisword-11))
2630 ENDCASE
2640 ENDWHILE
2650 WHILE stp(rec)
2660 pword=FNpull
2670 IF stp(rec)=0 THEN last=TRUE
2680 PROCpolish(pword,keyword$(pword))
2690 ENDWHILE
2700 PRINT"( ";eq$;") ";
2710 IF NOT last THEN PROCout("LDMFD R13!,{ans}")
2720 last=FALSE
2730 rec-=1
2740 ENDPROC
2750 :
2760 DEF PROCpolish(word,w$)
2770 IF word=constant THEN
2780 IF VAL(w$)>256 THEN
2790 consts+=1
2800 IF consts>maxconst THEN PROCerror("Too many constants")
2810 const(consts)=VAL(w$)
2820 ENDIF
2830 ENDIF
2840 CASE word OF
2850 WHEN neg:PROCout("LDMFD R13!,{ans}")
2860 PROCout("SUB ans,ans,ans,ASL#1")
2870 WHEN not:PROCout("LDMFD R13!,{ans}")
2880 PROCout("MVN ans,ans")
2890 WHEN constant:IF VAL(w$)>256 THEN PROCout("LDR ans,[const,#"+STR$((consts-1)<<2)+"]") ELSE PROCout("MOV ans,#"+STR$(VAL(w$)))
2900 WHEN var:PROCout("LDR ans,[var,#"+STR$((varnum-1)<<2)+"]")
2910 WHEN array:PROCarrayval
2920 WHEN sub,add,mul,div,eq,lt,gt,le,ge,ne,and,or,eor:
2930 PROCout("LDMFD R13!,{val1,val2}")
2940 CASE word OF
2950 WHEN sub:PROCout("SUB ans,val2,val1")
2960 WHEN add:PROCout("ADD ans,val1,val2")
2970 WHEN mul:PROCout("MUL ans,val1,val2")
2980 WHEN div:PROCout("BL  div"):divflag=TRUE
2990 WHEN and:PROCout("AND ans,val1,val2")
3000 WHEN or :PROCout("ORR ans,val1,val2")
3010 WHEN eor:PROCout("EOR ans,val1,val2")
3020 WHEN eq,lt,gt,le,ge,ne:
3030 PROCout("CMP val2,val1")
3040 PROCout("MOV ans,#0")
3050 CASE word OF
3060 WHEN eq:PROCout("MOVEQ ans,true")
3070 WHEN lt:PROCout("MOVLT ans,true")
3080 WHEN gt:PROCout("MOVGT ans,true")
3090 WHEN le:PROCout("MOVLE ans,true")
3100 WHEN ne:PROCout("MOVNE ans,true")
3110 ENDCASE
3120 ENDCASE
3130 ENDCASE
3140 IF NOT last THEN PROCout("STMFD R13!,{ans}")
3150 eq$+=w$+" "
3160 ENDPROC
3170 :
3180 DEF PROCarrayval
3190 PROCarraynum(line$)
3200 PROCout("LDR ans,[array,ans,ASL#2]")
3210 ENDPROC
3220 :
3230 DEF PROCpush(word,ord)
3240 WHILE ord<stack2(rec,stp(rec))
3250 pword=FNpull
3260 PROCpolish(pword,keyword$(pword))
3270 ENDWHILE
3280 IF word=cb THEN
3290 IF stack1(rec,stp(rec))<>ob THEN PROCerror("Unmatched ()")
3300 stp(rec)-=1
3310 ELSE
3320 stp(rec)+=1
3330 IF ord=6 THEN ord=2
3340 stack1(rec,stp(rec))=word
3350 stack2(rec,stp(rec))=ord
3360 ENDIF
3370 ENDPROC
3380 :
3390 DEF FNpull
3400 stp(rec)-=1
3410 =stack1(rec,stp(rec)+1)
3420 :
3430 DEF FNeqword(word)
3440 LOCAL case
3450 case=FALSE
3460 CASE word OF
3470 WHEN var,eq,lt,gt,le,ge,ne,sub,add,mul,div,cb,ob,constant,array,neg,and,or,eor,not:case=TRUE
3480 ENDCASE
3490 =case
3500 :
3510 DEF PROCnewvar
3520 IF vars=maxvars THEN PROCerror("Too many variables")
3530 vars+=1
3540 var$(vars)=LEFT$(line$,1)
3550 varnum=vars
3560 keyword=var
3570 ENDPROC
3580 :
3590 DEF PROCend
3600 endcomp=TRUE
3610 ENDPROC
3620 :
3630 DEF FNstripword(line$)
3640 line$=FNstripspaces(line$)
3650 lastword=thisword
3660 thisword=FNword(line$)
3670 word$=LEFT$(line$,wordlength)
3680 line$=FNstripspaces(MID$(line$,wordlength+1))
3690 sl=FALSE
3700 IF thisword<>newline THEN
3710 nextword=FNword(line$)
3720 PRINTkeyword$(thisword);" ";
3730 ELSE
3740 PRINT'
3750 ENDIF
3760 =line$
3770 :
3780 DEF FNstripspaces(l$)
3790 WHILE LEFT$(l$,1)=" "
3800 l$=MID$(l$,2)
3810 ENDWHILE
3820 =l$
3830 :
3840 DEF FNword(line$)
3850 LOCAL keyword,v,wl
3860 keyword=0:wl=0
3870 FOR key=2 TO keywords
3880 IF LEFT$(line$,LEN(keyword$(key)))=keyword$(key) AND LEN(keyword$(key))>wl THEN
3890 keyword=key
3900 wl=LEN(keyword$(key))
3910 ENDIF
3920 NEXT key
3930 IF keyword=unknown THEN
3940 varnum=0:v=0
3950 WHILE v<vars
3960 v+=1
3970 IF LEFT$(line$,1)=var$(v) THEN varnum=v
3980 ENDWHILE
3990 IF varnum>0 THEN
4000 keyword=var
4010 wl=1
4020 ELSE
4030 IF line$<>"" THEN
4040 IF sl AND FNword(MID$(line$,2))=eq THEN PROCnewvar:wl=1
4050 ENDIF
4060 ENDIF
4070 ENDIF
4080 IF keyword=unknown THEN
4090 lc=1
4100 WHILE MID$(line$,lc,1)>="0" AND MID$(line$,lc,1)<="9"
4110 lc+=1
4120 ENDWHILE
4130 lc-=1
4140 IF lc>0 THEN keyword=constant:wl=lc
4150 ENDIF
4160 wordlength=wl
4170 =keyword
4180 :
4190 DEF PROCerror(error$)
4200 *CLOSE
4210 PRINTerror$
4220 END
Bad program
```

Listing 17

```
.div
STMFD R13!,{r4-r6 ,R14}
MOV ans,#0
MOV shift,#0
MOV neg,#0
CMP val2,#0
MOVLT neg,#1
SUBLT val2,val2,val2,ASL#1
CMP val1,#0
EORLT neg,neg,#1
SUBLT val1,val1,val1,ASL#1
.r1
ADD shift,shift,#1
MOV val1,val1,ASL#1
CMP val1,val2
BLE r1
.r2
SUB shift,shift,#1
MOV val1,val1,ASR#1
CMP val2,val1
BLT r2
CMP val1,#0
ADDGE ans,ans,one,ASLshift
SUB val2,val2,val1
CMP shift,#0
BGT r2
CMP neg,#1
SUBEQ ans,ans,ans,ASL#1
LDMFD R13!,{r4-r6 ,PC}
```

Listing 18

```
m=31:d=m+1:v=d*d+1
b=15*d+13
x=0
WHILE x<=m
  y=0
  WHILE y<=m
    ARRAY(x+y*d)=0
    ARRAY(x+y*d+v)=0
    y=y+1
  ENDWHILE
  x=x+1
ENDWHILE
ARRAY(b)=1
ARRAY(b+1)=1
ARRAY(b+2)=1
ARRAY(b+3)=1
ARRAY(b+4)=1
ARRAY(b+d)=1
ARRAY(b+4+d*2)=1
VDU22,4,23,128,127,127,127,127,127,127,
127,0
x=0
WHILE x<=m
  y=0
  WHILE y<=m
    VDU 31,x,y,ARRAY(x+y*d)+32
    y=y+1
  ENDWHILE
  x=x+1
ENDWHILE

x=0
WHILE x<=m
  y=0
  WHILE y<=m
    y=y+1
  ENDWHILE
  x=x+1
ENDWHILE
t=0
WHILE t<100
x=0
WHILE x<=m
  y=0
  WHILE y<=m
    IF ARRAY(x+y*d) THEN
      q=-1
      WHILE q<=1
        w=-1
        WHILE w<=1
          n=(x+q)ANDm+((y+w)ANDm)*d+v
          ARRAY(n)=ARRAY(n)+1
          w=w+1
        ENDWHILE
        q=q+1
      ENDWHILE
    ENDIF
    y=y+1
  ENDWHILE
  x=x+1
ENDWHILE
x=0
WHILE x<=m
  y=0
  WHILE y<=m
    n=x+y*d
    IF (ARRAY(n+v)=3) AND (ARRAY(n)=0)
THEN
      ARRAY(n)=1
      VDU 31,x,y,128
    ENDIF
    IF (ARRAY(n+v)<>3) AND
(ARRAY(n+v)<>4) AND (ARRAY(n)=1) THEN
      ARRAY(n)=0
      VDU 31,x,y,32
    ENDIF
    ARRAY(n+v)=0
    y=y+1
  ENDWHILE
  x=x+1
ENDWHILE
t=t+1
VDU 31,32,0
PRINTt
ENDWHILE
```

Listing 19

```
a=0
WHILE a<10000
  a=a+1
  ARRAY(a)=1
ENDWHILE

a=1
WHILE a<100
  a=a+1
  IF ARRAY(a) THEN
    b=a
    WHILE b<=10000-a
      b=b+a
      ARRAY(b)=0
    ENDWHILE
  ENDIF
ENDWHILE

a=0
WHILE a<10000
  a=a+1
  IF ARRAY(a) THEN PRINTa;
```

```
ENDWHILE
```

Listing 20

```
   10 REM >DTsrc+ - Modified DoubleTake
(Info20)
   25 REM and John Robinson
   60 DIM code% &1000
  125 readvv=100
  330 EQUS "1.01 (14 Jan 1992) Dave Lawr
ence/John Robinson"
  430 EQUD donotuse
  435 EQUS "DoubleTake"
  441 ALIGN
  442 EQUD 0
  443 EQUD 0
  444 EQUD 0
  445 EQUD help
  446 EQUB 0
  450 .help   EQUS "Double clicking and
holding the second click or holding down
 Shift and double clicking will open "
  460 EQUS "application directories or s
end any file to !Edit."
  470 EQUB 0
  480 .donotuse
  862 CMP     R0,#19
  864 BEQ     file_not_loaded
  971 MOV     R0,#129
  972 MOV     R1,#&FF
  973 MOV     R2,#&FF
  974 SWI     "OS_Byte"
  975 TEQ     R1,#&FF
  976 BEQ     afterwait
 1065 .afterwait
 1680 MOV     R0,#18
 1751 .file_not_loaded
 1752 ADR     R0,variablename
 1753 ADD     R1,wp,#readvv
 1754 MOV     R2,#&FF000000
 1755 MOV     R3,#0
 1756 SWI     "XOS_ReadVarVal"
 1757 BMI     repeat
 1758 LDR     R0,runcommand
 1759 STR     R0,[wp,#32]
 1760 LDR     R0,runcommand+4
 1761 STR     R0,[wp,#36]
 1762 LDR     R0,runcommand+8
 1763 STR     R0,[wp,#40]
 1764 MOV     R0,#ASC"@"
 1765 STRB    R0,[wp,#31]
 1766 ADD     R0,wp,#31
 1767 SWI     "XWimp_StartTask"
 1768 B       repeat
 1769 .FinalCode
 2151 .variablename
 2152 EQUS    "Alias$@RunType_FFF"
 2153 EQUB    0
 2154 ALIGN
 2155 .runcommand
 2156 EQUS    "RunType_FFF "  \ 12 chara
cters
```

PIECES OF EIGHT

Listing 1

```
   10 REM >Turtle2 (Po81)
   20 REM By Dave Lawrence
   30 REM For BBC+Shadow/Master/RiscOS
   40 REM (C) BAU May 1992
   50 :
   60 arc=(HIMEM>&10000)
   70 MODE 129
   80 PROCscreen
   90 PROCinit
  100 dummy=FNclear
  110 ON ERROR PROCerror:GOTO 120
  120 REPEAT
  130 IF NOT (def OR rep>0) pc=top:step=
1
  140 Top=top
  150 PROCvars
  160 IF def c=1 ELSE IF rep>0 c=2 ELSE
c=0
  170 PROCturtle(c)
  180 PRINTRIGHT$("   "+STR$step,3);":";
STRING$(rep," ");:IF def VDU 32
  190 PROCc(1)
  200 PROCpointer(x,y,ang)
  210 INPUT ""in$
  220 PROCpointer(x,y,ang)
  230 PROCturtle(3)
  240 PROCc(0)
  250 COLOUR 0
  260 vars=FNsplit
  270 IF vars<>0 PROCcommand(FNcom(w$(0)
,TRUE),w$(1),w$(2))
  280 UNTIL done
  290 MODE 1
  300 END
  310 :
  320 DEF PROCc(s)
  330 VDU 23;10,255-152*s;0;0;0;
  340 ENDPROC
  350 :
  360 DEF PROCerr(err$)
  370 IF arc ERROR 1,err$
  380 ?&100=0:?&101=1:$&102=err$:CALL &1
00
  390 ENDPROC
  400 :
  410 DEF PROCerror
  420 IF ERR=17 AND INKEY-1 END
  430 PROCwind
  440 @%=&90A:REPORT:PRINT
  450 def=FALSE:run=FALSE:rep=0:top=Top
  460 ENDPROC
  470 :
  480 DEF FNsplit
  490 w$(0)="":w$(1)="":w$(2)="":in$=in$
+" ":w=0
  500 REPEAT
  510 w$=FNword
  520 IF w$<>"" w$(w)=FNlc(w$):w=w+1
  530 UNTIL w$="" OR w>2
  540 =w
  550 :
  560 DEF FNword
  570 i=0:REPEAT:i=i+1:UNTIL MID$(in$,i,
1)<>" "
  580 IF i>LENin$ THEN =""
  590 j=INSTR(in$," ",i)
  600 w$=MID$(in$,i,j-i)
  610 in$=MID$(in$,j)
  620 =w$
  630 :
  640 DEF FNlc(a$)
  650 b$=""
  660 FOR i=1 TO LENa$
  670 c$=MID$(a$,i,1)
  680 IF c$>="A" AND c$<="Z" c$=CHR$(ASC
c$+32)
  690 b$=b$+c$
  700 NEXT
  710 =b$
  720 :
  730 DEF FNcom(c$,trunc)
  740 IF c$="" THEN =-1
  750 IF trunc trunc=LENc$ ELSE trunc=25
5
  760 c=maxc:REPEAT:c=c-1
  770 IF c>=0 yes=(c$=LEFT$(c$(c),trunc)
)
  780 UNTIL c<0 OR yes
  790 =c
  800 :
  810 DEF PROCinit
  820 space=1024:maxc=40:maxrep=10
  830 DIM c$(maxc),vars(maxc),err$(maxc)
  840 DIM w$(2),repeat(maxrep),count(max
rep)
  850 DIM page space
  860 c=0:REPEAT:READ c$,vars(c)
  870 IF vars(c)<>0 READ err$(c)
  880 c$(c)=c$
  890 IF c$="+" c1=c
  900 IF c$<>"+" AND c$<>"*" c=c+1
  910 UNTIL c$="*"
  920 userc=c:lastc=c
  930 top=page:rep=0:def=FALSE:run=FALSE
:info=TRUE:done=FALSE
  940 com_end=FNcom("end",FALSE)
  950 ENDPROC
  960 :
  970 DATA to,0, list,0, forget,0, save,
0, load,0, quit,0
  980 DATA info,0, noinfo,0, +,0
  990 DATA clear,0, penup,0, pendown,0,
right,1,90, left,1,90
 1000 DATA forwards,1,Distance?, backwar
ds,1,Distance?, move,2,Move to?
 1010 DATA pencolour,1,Colour?, setcolou
r,2,"Pen,Colour?"
 1020 DATA thinlines,0, fatlines,1,Width
?, outline,1,Colour?
 1030 DATA scale,2,Factors?, setscale,2,
Factors?
 1040 DATA repeat,1,Number?, again,0
 1050 DATA end,0, *,0
 1060 :
 1070 DEF PROCcommand(cn,v1$,v2$)
 1080 IF cn<0 PRINT"Not defined":ENDPROC
 1090 IF cn<c1 AND def PRINT"Not in a de
finition":ENDPROC
 1100 v1=VALv1$:v2=VALv2$:oldpc=pc
 1110 IF NOT FNvcheck ENDPROC
 1120 PROCstore(cn,v1,v2)
 1130 IF FNexecute(cn,v1,v2) step=step+1
 ELSE pc=oldpc
 1140 ENDPROC
 1150 :
 1160 DEF FNvcheck
 1170 IF cn>=userc THEN =TRUE
 1180 IF vars-1=vars(cn) THEN =TRUE
 1190 err$=err$(cn)
 1200 IF RIGHT$(err$,1)<>"?" v1=VALerr$:
=TRUE
 1210 PRINTerr$
 1220 =FALSE
 1230 :
 1240 DEF FNexecute(com,var1,var2)
 1250 PROCvars
 1260 IF com<userc THEN =EVAL("FN"+c$(co
m))
 1270 LOCAL pc,top,def
 1280 pc=vars(com)
 1290 PROCrun(pc,0)
 1300 =TRUE
 1310 :
 1320 DEF PROCstore(com,var1,var2)
 1330 IF com<c1 ENDPROC
 1340 ?pc=com:pc=pc+1
 1350 IF vars(com)>0 ?pc=var1 MOD 256:pc
?1=var1 DIV 256:pc=pc+2
 1360 IF vars(com)>1 ?pc=var2 MOD 256:pc
?1=var2 DIV 256:pc=pc+2
 1370 ENDPROC
 1380 :
 1390 DEF PROCrun(pc,end)
 1400 LOCAL com,v1,v2,run
 1410 run=TRUE
 1420 REPEAT
 1430 PROCgetcom
 1440 dummy=FNexecute(com,v1,v2)
 1450 UNTIL com=com_end OR pc=end
 1460 ENDPROC
 1470 :
 1480 DEF PROCgetcom
 1490 com=?pc:pc=pc+1
 1500 vs=vars(com)
 1510 IF vs>0 v1=?pc+256*pc?1:pc=pc+2 EL
SE v1=0
 1520 IF vs>1 v2=?pc+256*pc?1:pc=pc+2 EL
SE v2=0
 1530 ENDPROC
 1540 :
 1550 DEF FNclear
 1560 x=0:y=0:ang=0:sc=1:col=3:wid=0:out
=-1:pen=TRUE:CLG
 1570 PROCvars
 1580 =TRUE
 1590 :
 1600 DEF FNquit:done=TRUE:=FALSE
 1610 DEF FNinfo:info=TRUE:=TRUE
 1620 DEF FNnoinfo:info=FALSE:=TRUE
 1630 DEF FNpenup:pen=FALSE:=TRUE
 1640 DEF FNpendown:pen=TRUE:=TRUE
 1650 DEF FNthinlines:wid=0:=TRUE
 1660 DEF FNfatlines:wid=var1:=TRUE
 1670 DEF FNoutline:out=var1:=TRUE
 1680 DEF FNpencolour:col=var1:=TRUE
 1690 DEF FNsetcolour:VDU 19,var1,var2;0
;:=TRUE
 1700 DEF FNright:ang=(ang+var1) MOD 360
:=TRUE
 1710 DEF FNleft:ang=(ang+360-var1) MOD
360:=TRUE
 1720 DEF FNmove:x=var1:y=var2:=TRUE
 1730 DEF FNscale:=FNmulby(sc)
 1740 DEF FNsetscale:=FNmulby(1)
 1750 DEF FNbackwards:var1=-var1:=FNforw
ards
 1760 :
 1770 DEF FNmulby(mul)
 1780 IF var1=0 var1=1
 1790 IF var2=0 var2=1
 1800 sc=mul*var1/var2
 1810 =TRUE
 1820 :
 1830 DEF FNforwards
 1840 ox=x:oy=y:sin=SINRADang:cos=COSRAD
ang:IF ang=0 cos=1
 1850 REMx=INT(x+var1*sc*sin+0.5):y=INT(
y+var1*sc*cos+0.5)
 1860 x=x+var1*sc*sin
 1870 y=y+var1*sc*cos
 1880 IF pen=0 THEN =TRUE
 1890 GCOL 0,col
 1900 IF wid=0 MOVE ox,oy:DRAW x,y ELSE
PROCwideline
 1910 =TRUE
 1920 :
 1930 DEF PROCwideline
 1940 wc=wid*cos
 1950 ws=wid*sin
 1960 MOVE ox-wc,oy+ws:MOVE ox+wc,oy-ws:
PLOT 85,x-wc,y+ws:PLOT 85,x+wc,y-ws
 1970 IF out<0 ENDPROC
 1980 GCOL 0,out
 1990 DRAW x-wc,y+ws:DRAW ox-wc,oy+ws:DR
AW ox+wc,oy-ws:DRAW x+wc,y-ws
 2000 ENDPROC
 2010 :
 2020 DEF FNrepeat
 2030 IF rep=maxrep PROCerr("Too deep!")
 2040 rep=rep+1:repeat(rep)=pc:count(rep
)=var1
 2050 =TRUE
 2060 :
 2070 DEF FNagain
 2080 IF rep=0 PRINT"No REPEAT":=FALSE
 2090 count(rep)=count(rep)-1
 2100 IF count(rep)<=0 rep=rep-1 :=TRUE
 2110 LOCAL again
 2120 again=pc
 2130 LOCAL pc,top,def
 2140 pc=repeat(rep)
 2150 PROCrun(pc,again)
 2160 =TRUE
 2170 :
 2180 DEF FNend
 2190 IF NOT (def OR run) PRINT"Nothing
to END":=FALSE
 2200 IF (NOT run AND rep>0) PRINT"Still
 in loop":=FALSE
 2210 top=pc:def=FALSE
 2220 =TRUE
 2230 :
 2240 DEF FNto
 2250 IF lastc=maxc PRINT"No room":=FALS
E
 2260 IF rep>0 PRINT"Still in loop":=FAL
SE
 2270 IF FNcom(v1$,FALSE)>=0 PRINT"Alrea
dy defined":=FALSE
 2280 c$(lastc)=v1$
 2290 vars(lastc)=pc
 2300 lastc=lastc+1
 2310 def=TRUE
 2320 =FALSE
 2330 :
 2340 DEF FNlist
 2350 IF vars=1 THEN =FNusers
 2360 list=FNcom(v1$,TRUE)
 2370 IF list<userc PRINT"Not defined" :
=FALSE
 2380 LOCAL pc
 2390 pc=vars(list)
 2400 PROCfull:VDU 28,1,25,20,1,30
 2410 COLOUR 128:COLOUR 3
 2420 PRINT"to ";c$(list)'
 2430 spc=1:REPEAT:PROCgetcom
 2440 c$=c$(com)
 2450 IF c$="again" OR c$="end" spc=spc-
1:IF c$="end" PRINT
 2460 PRINTSTRING$(spc," ");c$(com);" ";
 2470 IF c$="repeat" spc=spc+1
 2480 IF vs>0 AND vs<3 PRINT;v1;" ";:IF
vs>1 PRINT;v2;
 2490 PRINT
 2500 UNTIL com=com_end
 2510 PROCwind
 2520 COLOUR 131
 2530 =FALSE
 2540 :
 2550 DEF FNusers
 2560 IF lastc=userc PRINT"No user funct
ions" :=FALSE
 2570 PROCfull:VDU 28,1,25,20,1,30
 2580 COLOUR 128:COLOUR 3
 2590 FOR i=userc TO lastc-1
 2600 PRINT"to ";c$(i)
 2610 NEXT
 2620 PROCwind
 2630 COLOUR 131
 2640 =FALSE
 2650 :
 2660 DEF FNforget
 2670 list=FNcom(v1$,TRUE)
 2680 IF list<userc PRINT"Not defined" :
=FALSE
 2690 vars(lastc)=top
 2700 top=vars(list)
 2710 REPEAT
 2720 IF list<>lastc-1 PROCshuffle:list=
list+1
 2730 UNTIL list=lastc-1
 2740 vars(list)=0
 2750 c$(list)=""
 2760 lastc=lastc-1
 2770 =FALSE
 2780 :
 2790 DEF PROCshuffle
 2800 vars(list)=top
 2810 c$(list)=c$(list+1)
 2820 FOR i=0 TO vars(list+2)-vars(list+
1)-1
 2830 PRINT"(";~vars(list+1)+i;"->";~top
;")"
 2840 ?top=vars(list+1)?i
 2850 top=top+1
 2860 NEXT
 2870 ENDPROC
 2880 :
 2890 DEF FNload
 2900 in=OPENIN(v1$)
 2910 INPUT#in,lastc
 2920 lastc=userc+lastc
 2930 FOR i=userc TO lastc-1
 2940 INPUT#in,c$(i),v
 2950 vars(i)=v+page
 2960 NEXT
 2970 top=page
 2980 REPEAT
 2990 ?top=BGET#in
 3000 top=top+1
 3010 UNTIL EOF#in
 3020 CLOSE #in
 3030 =FALSE
 3040 :
 3050 DEF FNsave
 3060 IF lastc=userc PRINT"No user funct
ions" :=FALSE
 3070 out=OPENOUT(v1$)
 3080 PRINT#out,lastc-userc
 3090 FOR i=userc TO lastc-1
 3100 PRINT#out,c$(i),vars(i)-page
 3110 NEXT
 3120 FOR i=page TO top-1
 3130 BPUT#out,?i
 3140 NEXT
 3150 CLOSE #out
 3160 =FALSE
 3170 :
 3180 DEF PROCscreen
 3190 COLOUR 0
 3200 COLOUR 131
 3210 VDU 23,224,0,0,63,106,209,255,146,
127
 3220 VDU 23,225,0,0,248,44,70,255,73,25
5
 3230 VDU 23,226,0,0,0,0,60,118,252,248
 3240 VDU 23,227,6,124,248,0,0,0,0,0
 3250 VDU24,8;164;1271;1012;29,640;592;1
2,16,19,2,4;0;
 3260 PROCfull
 3270 PROCwind
 3280 ENDPROC
 3290 :
 3300 DEF PROCvars
 3310 IF NOT info ENDPROC
 3320 PROCfull
 3330 COLOUR 0
 3340 PROCv("X",INTx,27)
 3350 PROCv("Y",INTy,28)
```

```
3360 @%=&020200
3370 PROCv("Scale",sc,29)
3380 @%=&090A
3390 PROCv("Angle",INTang,30)
3400 PROCwind
3410 ENDPROC
3420 :
3430 DEF PROCpointer(px,py,pa)
3440 GCOL 4,3
3450 sp=30*SINRAD(pa+30):cp=30*COSRAD(p
a+30)
3460 sm=30*SINRAD(pa-30):cm=30*COSRAD(p
a-30)
3470 MOVE px-sp,py-cp:DRAW px,py:DRAW p
x-sm,py-cm
3480 ENDPROC
3490 :
3500 DEF PROCv(h$,v,vy)
3510 PRINTTAB(28,vy);h$;TAB(34,vy);SPC6
;TAB(34,vy);v;
3520 ENDPROC
3530 :
3540 DEF PROCfull
3550 xpos=POS:ypos=VPOS
3560 VDU 28,0,31,39,0
3570 ENDPROC
3580 :
3590 DEF PROCwind
3600 VDU 28,5,31,26,27,31,xpos,ypos
3610 ENDPROC
3620 :
3630 DEF PROCturtle(col)
3640 PROCfull
3650 COLOUR col
3660 VDU 31,1,29,224,225,226,31,1,30,22
7,227
3670 PROCwind
3680 ENDPROC
```

Listing 2

```
10 REM >Galaxy (Po82)
20 REM by Andrew Rankin
30 REM for B+/M/C/A
40 REM (c) BAU July 1989
50 IFPAGE>&1100 AND HIMEM<&10000 THEN
PAGE=&1100:CHAIN"Galaxy"
60 :
70 MODE 128
80 v$="1.02"
90 DIM x(750),y(750),z(750),u(750),v(
750),w(750)
100 galr=30:galm=5:galri=10:galc%=12
110 mz%=2
120 phase%=1:@%=&50A
130 title$="COLLIDING GALAXIES SIMULAT
ION version "+v$
140 REPEAT
150 ONphase% PROCsetup,PROCsimulation
ELSE
160 UNTIL phase%=3
170 END
180
190 DEF PROCsetup
200 CLS
210 VDU 19,1,4;0;19,0,7;0;
220 PRINT TAB(19,0)title$
230 PRINT '"  This program  simulates
the passing of  two galaxies  in close
proximity. To"
240 PRINT "  simplify  calculations  o
f  star  positions  it is  assumed  that
 all  of the"
250 PRINT "  galactic mass is at the c
entre and ignores the gravitational fiel
d due to the"
260 PRINT "  surrounding  stars. It is
 assumed  the effects  of forces  other
than gravity"
270 PRINT "  are negligible. The  targ
et  galaxy  is taken to be a disk of sta
rs in stable"
280 PRINT "  circular  orbit with zero
 drift velocity  and the intruder  is t
aken to be a"
290 PRINT "  point of comparable mass.
"
300 :
310 PRINT TAB(1,12)"SET UP:"TAB(1,13)"
In the target galaxy:"
320 INPUT TAB(10,14)"How many rings of
 stars are required ",rings%
330 INPUT TAB(10,15)"How many stars pe
r ring are required ",stpr%
340 stars%=stpr%*rings%:dr=(galr-galri
)/(rings%-1)
350 PRINT "  The target galaxy is loca
ted at coordinates (0,0,0) with zero";
360 PRINT " drift velocity,"
370 PRINT "  and mass  5.0 mass units.
 ";stars%" stars rotate  in  circular ";
380 PRINT "orbits of  10 to  30"'"  di
stance units."
390 PRINT TAB(1,19)"For the intruder g
alaxy:"
400 INPUT TAB(10,20)"Mass as a fractio
n (%) of target galaxy ",massfr
410 INPUT TAB(10,21)"Distance from tar
get galaxy:"TAB(10,22)"X (-70 to 70) ? "
d
420 INPUT TAB(33,22)"Y (-70 to 70) ? "
e TAB(56,22)"Z (-35 to 35) ? "f
430 INPUT TAB(10,23)"Velocity componen
ts:"TAB(10,24)"X ?  "r TAB(33,24)"Y ?  "
s
440 INPUT TAB(56,24)"Z ?  "t
450 PRINT TAB(5,26)"Set up complete -
select (A)lter set up, (R)un simulation"
;
460 PRINT ", (E)xit   [ ]"TAB(74,26);
470 REPEAT
480 ans$=GET$
490 PRINT TAB(74,26)ans$;
500 phase%=INSTR("ARE",ans$)
510 UNTIL phase%>0
520 stop%=-1
530 ENDPROC
540
550 DEF PROCsimulation
560 VDU 12,20,19,0,4;0;23,1,0,0,0,0,0,
0,0,0
570 m=galm
580 n=m*massfr/100
590 a=150:b=100:c=0:d=a+d:e=e+b:f=f+c
600 o=0:p=0:q=0
610 T%=0:I%=0:sf=2
620 PRINT TAB(19,0)title$TAB(15,1)"--
--Target galaxy——"
630 PRINT TAB(49,1)"——-Intruder ga
laxy——-"
640 PRINT TAB(17,2)"- start:"TAB(35,2)
"- now:"
650 PRINT TAB(51,2)"- start:"TAB(69,2)
"- now:"
660 PRINT TAB(1,3)"Mass"TAB(15,3)m TAB
(31,3)m TAB(49,3)n TAB(65,3)n
670 PRINT TAB(1,4)"X coordinate"TAB(1,
5)"Y coordinate"TAB(1,6)"Z coordinate"
680 PRINT TAB(1,7)"Velocity (X)"TAB(1,
8)"Velocity (Y)"TAB(1,9)"Velocity (Z)"
690 PRINT TAB(1,11)"X-Y plane"TAB(41,1
1)"X-Z plane (Z shown x 2)"
700 PRINT TAB(70,11)"Time"TAB(15,4)a T
AB(49,4)d TAB(15,5)b TAB(49,5)e
710 PRINT TAB(15,6)c TAB(49,6)f TAB(15
,7)o TAB(49,7)r
720 PRINT TAB(15,8)p TAB(49,8)s TAB(15
,9)q TAB(49,9)t TAB(75,11);T%
730 FOR J%=0 TO rings%-1
740 rad=J%*dr+galri
750 vel=SQR(m/rad)
760 theta=0.5*vel/rad
770 IF J%=0 THEN vel=0.9*vel
780 FOR K%=0 TO stpr%-1
790 g=K%*2*PI/stpr%
800 x(I%)=rad*COS(g)+150
810 y(I%)=rad*SIN(g)+100
820 z(I%)=0
830 w(I%)=0
840 v(I%)=vel*COS(g-theta)
850 u(I%)=-vel*SIN(g-theta)
860 I%=I%+1
870 NEXT:NEXT
880 PROCplotgalaxies
890 PROCkey
900 REPEAT
910 FOR I%=0 TO stars%-1
920 f1=m/((x(I%)-a)^2+(y(I%)-b)^2+(z(I
%)-c)^2+sf)^1.5
930 f2=n/((x(I%)-d)^2+(y(I%)-e)^2+(z(I
%)-f)^2+sf)^1.5
940 ax=f1*(a-x(I%))+f2*(d-x(I%))
950 ay=f1*(b-y(I%))+f2*(e-y(I%))
960 az=f1*(c-z(I%))+f2*(f-z(I%))
970 u(I%)=u(I%)+ax
980 v(I%)=v(I%)+ay
990 w(I%)=w(I%)+az
1000 x(I%)=x(I%)+u(I%)
1010 y(I%)=y(I%)+v(I%)
1020 z(I%)=z(I%)+w(I%)
1030 NEXT
1040 rad=((a-d)^2+(b-e)^2+(c-f)^2+sf)^1
.5
1050 ax=(d-a)/rad
1060 ay=(e-b)/rad
1070 az=(f-c)/rad
1080 o=n*ax+o
1090 p=n*ay+p
1100 q=n*az+q
1110 r=r-m*ax
1120 s=s-m*ay
1130 t=t-m*az
1140 a=a+o
1150 b=b+p
1160 c=c+q
1170 d=d+r
1180 e=e+s
1190 f=f+t
1200 T%=T%+1
1210 PROCplotgalaxies
1220 key%=INKEY(5)
1230 IF key%=80 OR T%=stop% PROCwait
1240 IF key%=73 PROCiterate
1250 IF key%=71 PROCsdump:key%=INKEY(5)
1260 IF key%=83 phase%=1
1270 IF key%=69 phase%=3
1280 UNTIL phase%<>2
1290 ENDPROC
1300 :
1310 DEF PROCplotgalaxies
1320 PRINT TAB(31,4)a TAB(65,4)d TAB(31
,5)b TAB(65,5)e TAB(31,6)c TAB(65,6)f
1330 PRINT TAB(31,7)o TAB(65,7)r TAB(31
,8)p TAB(65,8)s TAB(31,9)q TAB(65,9)t
1340 PRINT TAB(75,11);T%
1350 VDU 28,0,31,79,12,12,26
1360 MOVE 640,0:DRAW 640,640
1370 MOVE 0,640:DRAW 1279,640
1380 g=(m*a+n*d)/(m+n)
1390 h=(m*b+n*e)/(m+n)
1400 i=(m*c+n*f)/(m+n)
1410 :
1420 VDU 26,24,0;0;640;640;
1430 PROCc((a-g)*4.267+320,(h-b)*4.267+
320)
1440 PROCd((d-g)*4.267+320,(h-e)*4.267+
320)
1450 VDU 26,24,640;0;1279;640;
1460 PROCc((a-g)*4.267+960,(i-c)*4.267*
mz%+320)
1470 PROCd((d-g)*4.267+960,(i-f)*4.267*
mz%+320)
1480 FOR I%=0 TO stars%-1
1490 VDU 26,24,0;0;640;640;:PLOT 69,(x(
I%)-g)*4.267+320,(h-y(I%))*4.267+320
1500 VDU 26,24,640;0;1279;640;:PLOT 69,
(x(I%)-g)*4.267+960,(i-z(I%))*mz%*4.267+
320
1510 NEXT
1520 ENDPROC
1530 :
1540 DEF PROCc(A%,B%)
1550 LOCAL I%,a,b
1560 PLOT 69,A%,B%
1570 FOR I%=0 TO 3
1580 a=galc%*COS(PI/8*I%)
1590 b=galc%*SIN(PI/8*I%)
1600 PLOT 69,A%+a*2,B%+b*2:PLOT 69,A%-b
*2,B%+a*2
1610 PLOT 69,A%-a*2,B%-b*2:PLOT 69,A%+b
*2,B%-a*2
1620 PLOT 69,A%+a,B%+b:PLOT 69,A%-b,B%+
a
1630 PLOT 69,A%-a,B%-b:PLOT69,A%+b,B%-a
1640 NEXT
1650 ENDPROC
1660 :
1670 DEF PROCd(A%,B%)
1680 LOCAL I%,a
1690 MOVE A%+galc%,B%
1700 FOR I%=1 TO 16
1710 MOVE A%,B%
1720 a=PI*I%/8
1730 PLOT 85,A%+galc%*COS(a),B%+galc%*S
IN(a)
1740 NEXT
1750 ENDPROC
1760 :
1770 DEF PROCsdump
1780 *FX 6,0
1790 */C.SDUMP
1800 ENDPROC
1810 :
1820 DEF PROCwait
1830 PRINT TAB(68,10)"..waiting.."
1840 REPEAT
1850 key%=INKEY(5)
1860 UNTIL key%<>-1
1870 PRINT TAB(68,10)SPC(11)
1880 ENDPROC
1890 :
1900 DEF PROCiterate
1910 PRINTTAB(11,10)SPC68TAB(11,10)"Ite
rate until time = ";
1920 INPUT,stop%
1930 PROCkey
1940 ENDPROC
1950 :
1960 DEF PROCkey
1970 COLOUR 129:COLOUR 0
1980 PRINT TAB(11,10)"(P)ause  (I)terat
ions  (G)raphics dump  (S)et up  (E)xit"
1990 COLOUR 128:COLOUR 1
2000 ENDPROC
```

Listing 3

```
10 REM >BBCland (Po83)
20 REM By David Lawrence
30 REM For BBC B/B+/M/C/E/A
40 REM (C) BBC Acorn User Sep 1989
50 IFPAGE>&1100 AND HIMEM<&10000 THEN
PAGE=&1100:CHAIN"BBCland"
60 :
70 MODE 1:VDU 23;8202;0;0;0;
80 PROCinit
90 PROCfaults(faults)
100 PROClevels
110 PROCdraw
120 END
130 :
140 DEF PROCinit
150 size%    = 10
160 xscale%  = 64
170 yscale%  = 32
180 zscale%  = 4
190 circular = TRUE
200 linear   = FALSE
210 faults   = 50
220 delta    = 3
230 :
240 DIM land(size%,size%)
250 DIM s%(2),x%(2),y%(2),height(3)
260 VDU 19,3,4;0;
270 black=0
280 blue=3
290 ENDPROC
300 :
310 DEF PROCfaults(num%)
320 FOR i%=1 TO num%
330 PRINT TAB(0,0);"Faults left:";num%
-i%;" "
340 IF circular PROCcircle
350 IF linear PROCline
360 NEXT
370 ENDPROC
380 :
390 DEF PROCcircle
400 x%=RND(size%)-1
410 y%=RND(size%)-1
420 r%=(RND(size%)-1)^2
430 add=SGNRND*RND(1)*delta
440 FOR X%=0 TO size%
450 dx=(X%-x%)^2
460 IF dx<r% PROCdocirc
470 NEXT
480 ENDPROC
490 :
500 DEF PROCdocirc
510 dy=SQR(r%-dx)
520 y1=y%-dy
530 y2=y%+dy
540 IF y1<0 y1=0
550 IF y2>=size% y2=size%-1
560 FOR Y%=y1 TO y2
570 land(X%,Y%)=land(X%,Y%)+add
580 NEXT
590 ENDPROC
600 :
610 DEF PROCline
620 REPEAT
630 s%(1)=RND(4):s%(2)=RND(4)
640 UNTIL s%(1)<>s%(2)
650 REPEAT
660 FOR J%=1 TO 2
670 IF s%(J%)=1 x%(J%)=0:y%(J%)=RND(si
ze%)-1
680 IF s%(J%)=2 x%(J%)=RND(size%)-1:y%
(J%)=size%
690 IF s%(J%)=3 x%(J%)=size%:y%(J%)=RN
D(size%)-1
700 IF s%(J%)=4 x%(J%)=RND(size%)-1:y%
(J%)=0
710 NEXT
720 UNTIL x%(1)<>x%(2) AND y%(1)<>y%(2
)
730 M=(y%(2)-y%(1))/(x%(2)-x%(1))
740 C=y%(1)-M*x%(1)
750 add=SGNRND*RND(1)*delta
760 FOR X%=0 TO size%
770 Y%=M*X%+C
780 IF Y%<0 Y%=0
790 IF Y%<=size% PROCdoline
800 NEXT
810 ENDPROC
820 :
830 DEF PROCdoline
840 FOR y%=Y% TO size%
850 land(X%,y%)=land(X%,y%)+add
860 NEXT
870 ENDPROC
880 :
890 DEF PROClevels
900 base=0
910 peak=0
920 aver=0
930 land(size%,size%)=land(size%-1,siz
e%-1)
940 FOR X%=0 TO size%-1
950 land(X%,size%)=land(X%,size%-1)
960 land(size%,X%)=land(size%-1,X%)
970 aver=aver+land(X%,size%)+land(size
%,X%)
980 FOR Y%=0 TO size%-1
990 aver=aver+land(X%,Y%)
1000 av=(land(X%,Y%)+land(X%+1,Y%)+land
(X%,Y%+1)+land(X%+1,Y%+1))/4
1010 IF av<base base=av
1020 IF av>peak peak=av
1030 NEXT
1040 NEXT
1050 water=aver/(size%*size%)
1060 ENDPROC
1070 :
1080 DEF PROCdraw
1090 CLS
1100 col%=1
1110 FOR I%=0 TO size%-1
1120 FOR J%=0 TO size%-1
1130 PROCpatch(I%,J%)
1140 IF I%=size%-1 PROCside(col%)
1150 col%=3-col%
1160 NEXT
1170 col%=3-col%
1180 PROCedge(col%)
1190 NEXT
1200 GCOL 0,0
1210 PROC3d(4,size%,size%,water)
1220 PROC3d(5,size%,size%,base)
1230 PROC3dd(5,size%,size%)
1240 ENDPROC
1250 :
1260 DEF PROCpatch(X%,Y%)
1270 height(0)=land(X%,Y%)-water
1280 height(1)=land(X%+1,Y%)-water
1290 height(2)=land(X%+1,Y%+1)-water
1300 height(3)=land(X%,Y%+1)-water
1310 F$="FN"
1320 FOR i%=0 TO 3
1330 IF height(i%)<0 F$=F$+"b" ELSE F$=
F$+"a"
1340 NEXT
1350 PROCsea
1360 GCOL 0,col%
1370 null=EVAL(F$)
1380 ENDPROC
1390 :
1400 DEF PROCedge(col%)
1410 GCOL 0,blue
1420 PROC3d(4,I%,size%,base)
1430 PROC3d(4,I%+1,size%,base)
1440 PROC3d(85,I%,size%,water)
1450 PROC3d(85,I%+1,size%,water)
1460 GCOL 0,black
1470 PROC3d(5,I%,size%,water)
1480 GCOL 0,col%
1490 PROC3d(4,I%,size%,base)
1500 PROC3d(4,I%+1,size%,base)
1510 PROC3dd(85,I%,size%)
1520 PROC3dd(85,I%+1,size%)
1530 GCOL 0,0
1540 PROC3dd(5,I%,size%)
1550 ENDPROC
1560 :
1570 DEF PROCside(col%)
1580 GCOL 0,blue
```

```
1590 PROC3d(4,size%,J%,base)
1600 PROC3d(4,size%,J%+1,base)
1610 PROC3d(85,size%,J%,water)
1620 PROC3d(85,size%,J%+1,water)
1630 GCOL 0,0
1640 PROC3d(5,size%,J%,water)
1650 GCOL 0,col%
1660 PROC3d(4,size%,J%,base)
1670 PROC3d(4,size%,J%+1,base)
1680 PROC3dd(85,size%,J%)
1690 PROC3dd(85,size%,J%+1)
1700 GCOL 0,0
1710 PROC3dd(5,size%,J%)
1720 ENDPROC
1730 :
1740 DEF PROCsea
1750 GCOL 0,blue
1760 PROC3d(4,X%,Y%,water)
1770 PROC3d(4,X%+1,Y%,water)
1780 PROC3d(85,X%,Y%+1,water)
1790 PROC3d(85,X%+1,Y%+1,water)
1800 ENDPROC
1810 :
1820 DEF FNaaaa
1830 PROC3dd(4,X%,Y%)
1840 PROC3dd(4,X%+1,Y%)
1850 PROC3dd(85,X%,Y%+1)
1860 PROC3dd(85,X%+1,Y%+1)
1870 GCOL 0,black
1880 PROC3dd(5,X%+1,Y%)
1890 PROC3dd(5,X%,Y%)
1900 PROC3dd(5,X%,Y%+1)
1910 PROC3dd(5,X%+1,Y%+1)
1920 =0
1930 :
1940 DEF FNaaab
1950 PROC3dd(4,X%,Y%)
1960 PROC3dd(4,X%+1,Y%)
1970 PROC3dm(85,3)
1980 PROC3dd(85,X%+1,Y%+1)
1990 PROC3dm(85,2)
2000 GCOL 0,black
2010 PROC3dm(5,3)
2020 PROC3dd(5,X%,Y%)
2030 PROC3dd(5,X%+1,Y%)
2040 PROC3dd(5,X%+1,Y%+1)
2050 PROC3dm(5,2)
2060 =0
2070 :
2080 DEF FNaaba
2090 PROC3dd(4,X%,Y%)
2100 PROC3dd(4,X%,Y%+1)
2110 PROC3dd(85,X%+1,Y%)
2120 PROC3dm(85,2)
2130 PROC3dm(85,1)
2140 GCOL 0,black
2150 PROC3dm(5,2)
2160 PROC3dd(5,X%,Y%+1)
2170 PROC3dd(5,X%,Y%)
2180 PROC3dd(5,X%+1,Y%)
2190 PROC3dm(5,1)
2200 =0
2210 :
2220 DEF FNaabb
2230 PROC3dd(4,X%,Y%)
2240 PROC3dd(4,X%+1,Y%)
2250 PROC3dm(85,3)
2260 PROC3dm(85,1)
2270 GCOL 0,black
2280 PROC3dm(5,3)
2290 PROC3dd(5,X%,Y%)
2300 PROC3dd(5,X%+1,Y%)
2310 PROC3dm(5,1)
2320 =0
2330 :
2340 DEF FNabaa
2350 PROC3dd(4,X%,Y%+1)
2360 PROC3dd(4,X%+1,Y%+1)
2370 PROC3dd(85,X%,Y%)
2380 PROC3dm(85,1)
2390 PROC3dm(85,0)
2400 GCOL 0,black
2410 PROC3dm(5,1)
2420 PROC3dd(5,X%+1,Y%+1)
2430 PROC3dd(5,X%,Y%+1)
2440 PROC3dd(5,X%,Y%)
2450 PROC3dm(5,0)
2460 =0
2470 :
2480 DEF FNabab
2490 PROCtri(0)
2500 GCOL 0,col%
2510 PROCtri(2)
2520 =0
2530 :
2540 DEF FNabba
2550 PROC3dd(4,X%,Y%)
2560 PROC3dd(4,X%,Y%+1)
2570 PROC3dm(85,0)
2580 PROC3dm(85,2)
2590 GCOL 0,black
2600 PROC3dd(5,X%,Y%+1)
2610 PROC3dd(5,X%,Y%)
2620 PROC3dm(5,0)
2630 PROC3dm(5,2)
2640 =0
2650 :
2660 DEF FNabbb
2670 PROCtri(0)
2680 =0
2690 :
2700 DEF FNbaaa
2710 PROC3dm(4,3)
2720 PROC3dm(4,0)
2730 PROC3dd(85,X%,Y%+1)
2740 PROC3dd(85,X%+1,Y%)
2750 PROC3dd(85,X%+1,Y%+1)
2760 GCOL 0,black
2770 PROC3dd(5,X%,Y%+1)
2780 PROC3dm(5,3)
2790 PROC3dm(5,0)
2800 PROC3dd(5,X%+1,Y%)
2810 PROC3dd(5,X%+1,Y%+1)
2820 =0
2830 :
2840 DEF FNbaab
2850 PROC3dd(4,X%+1,Y%+1)
2860 PROC3dd(4,X%+1,Y%)
2870 PROC3dm(85,2)
2880 PROC3dm(85,0)
2890 GCOL 0,black
2900 PROC3dm(5,2)
2910 PROC3dd(5,X%+1,Y%+1)
2920 PROC3dd(5,X%+1,Y%)
2930 PROC3dm(5,0)
2940 =0
2950 :
2960 DEF FNbaba
2970 PROCtri(1)
2980 GCOL 0,col%
2990 PROCtri(3)
3000 =0
3010 :
3020 DEF FNbabb
3030 PROCtri(1)
3040 =0
3050 :
3060 DEF FNbbaa
3070 PROC3dd(4,X%+1,Y%+1)
3080 PROC3dd(4,X%,Y%+1)
3090 PROC3dm(85,1)
3100 PROC3dm(85,3)
3110 GCOL 0,black
3120 PROC3dm(5,1)
3130 PROC3dd(5,X%+1,Y%+1)
3140 PROC3dd(5,X%,Y%+1)
3150 PROC3dm(5,3)
3160 =0
3170 :
3180 DEF FNbbab
3190 PROCtri(2)
3200 =0
3210 :
3220 DEF FNbbba
3230 PROCtri(3)
3240 =0
3250 :
3260 DEF FNbbbb
3270 =0
3280 :
3290 DEF PROCtat(x%,y%,s1%,s2%)
3300 PROC3dd(4,x%,y%)
3310 PROC3dm(4,s1%)
3320 PROC3dm(85,s2%)
3330 GCOL 0,black
3340 PROC3dm(5,s1%)
3350 PROC3dd(5,x%,y%)
3360 PROC3dm(5,s2%)
3370 ENDPROC
3380 :
3390 DEF PROCtri(t%)
3400 IF t%=0 PROCtat(X%,Y%,3,0)
3410 IF t%=1 PROCtat(X%+1,Y%,0,1)
3420 IF t%=2 PROCtat(X%+1,Y%+1,1,2)
3430 IF t%=3 PROCtat(X%,Y%+1,2,3)
3440 ENDPROC
3450 :
3460 DEF PROC3dm(o%,s%)
3470 IF s%=0 PROCmid(o%,X%,Y%,1,0,0,1)
3480 IF s%=1 PROCmid(o%,X%+1,Y%,0,1,1,2
)
3490 IF s%=2 PROCmid(o%,X%,Y%+1,1,0,3,2
)
3500 IF s%=3 PROCmid(o%,X%,Y%,0,1,0,3)
3510 ENDPROC
3520 :
3530 DEF PROCmid(o%,xs,ys,xa,ya,zs,ze)
3540 d=height(zs)/(height(zs)-height(ze
))
3550 IF xa PROC3d(o%,xs+d*xa,ys,water)
ELSE PROC3d(o%,xs,ys+d*ya,water)
3560 ENDPROC
3570 :
3580 DEF PROC3dd(o%,X,Y)
3590 PROC3d(o%,X,Y,land(X,Y))
3600 ENDPROC
3610 :
3620 DEF PROC3d(o%,X,Y,Z)
3630 PLOT o%,640+(X-Y)*xscale%,850-(X+Y
)*yscale%+Z*zscale%
3640 ENDPROC
```

Listing 4

```
10 REM Roman Calculator (Po84)
20 REM by Michael Leete
30 REM for B/B+/M/C/A
40 REM (c) BAU June 1990
50 :
60 *FX212,216
70 m%=0:d%=0:c%=0:l%=0:x%=0:v%=0:i%=0
80 mneg%=0:dneg%=0:cneg%=0:lneg%=0:xn
eg%=0:vneg%=0:ineg%=0
90 DIM fasti$(34),Month$(12)
100 DIM menu$(5)
110 Kingdomcome=0
120 ON ERROR RUN
130 MODE 4
140 VDU19,0,6,0;0;0;
150 VDU19,1,0,0;0;0;
160 REPEAT
170 choice=FNmenu(1,5)
180 IF choice=1 PRINTTAB(16,12)"Valete
":VDU23,1,3;0;0;0;:PROCdel(4):MODE 7:END
190 IF choice=2 RUN
200 IF choice=3 PROCconvert
210 IF choice=4 PROCcalendar
220 IF choice=5 PROCadd
230 UNTIL FALSE
240 :
250 DEF FNmenu(min,max)
260 menu$(1)="Quit      "
270 menu$(2)="Re-start  "
280 menu$(3)="Conversion"
290 menu$(4)="Calendar  "
300 menu$(5)="Addition  "
310 VDU23,1,0;0;0;0;
320 LOCAL menuptr,loop%
330 *FX4,1
340 menuptr=1
350 PROCdouble(128,18,"Press RETURN no
w")
360 PROCdouble(128,2,"AS THE ROMANS DI
D")
370 REPEAT
380 FOR loop%=min TO max
390 IF loop%=menuptr PROCexplain(menup
tr):COLOUR0:COLOUR129 ELSE COLOUR1:COLOU
R128
400 PRINTTAB(14,3+loop%*2);menu$(loop%
)
410 NEXT
420 COLOUR1:COLOUR128
430 key=GET
440 IF key=139 menuptr=menuptr-1:IF me
nuptr=0:menuptr=max
450 IF key=138 menuptr=menuptr+1:IF me
nuptr=max+1 menuptr=1
460 UNTIL key=13
470 *FX4,0
480 PROCclosewindow(15,8,len,max+1)
490 =menuptr
500 :
510 DEF PROCclosewindow(x,y,len,ht)
520 VDU26
530 GCOL 0,0
540 PROCopenwindow(x,y,len,ht)
550 CLS
560 VDU 26
570 GCOL 0,1
580 ENDPROC
590 :
600 DEF PROCopenwindow(x,y,len,ht)
610 VDU28,x,y+ht,x+len-1,y
620 PROCrect(x*32-8,1016-(y+ht)*32,len
*32+12,ht*32+12,0)
630 PROCrect(x*32,1008-(y+ht)*32,len*3
2+16,8,1)
640 PROCrect((x+len)*32+8,1008-(y+ht)*
32,8,ht*32+8,1)
650 ENDPROC
660 :
670 DEF PROCrect(x,y,l,w,f)
680 MOVE x,y
690 DRAW x+l,y
700 IF f=0 DRAW x+l,y+w ELSE PLOT 85,x
,y+w
710 IF f=0 DRAW x+l,y+w ELSE PLOT 85,x
+l,y+w
720 MOVE x,y+w
730 IF f=0 DRAW x,y ELSE MOVE x,y
740 ENDPROC
750 :
760 DEF PROCdouble(x,y,z$)
770 LOCAL c%
780 c%=&70
790 IF x>80 THEN PRINTTAB(20-LENz$ DIV
2,y);:ELSE PRINTTAB(x,y);
800 FOR loop%=1 TO LEN(z$)
810 ?c%=ASC(MID$(z$,loop%,1))
820 X%=c% MOD 256
830 Y%=c% DIV 256
840 A%=10
850 CALL &FFF1
860 VDU23,128,c%?1,c%?1,c%?2,c%?2,c%?3
,c%?3,c%?4,c%?4,128,10,8,23,128,c%?5,c%?
5,c%?6,c%?6,c%?7,c%?7,c%?8,c%?8,128,11
870 NEXT
880 ENDPROC
890 :
900 DEF PROCexplain(m)
910 PRINTTAB(0,22);STRING$(240," ")
920 PRINTTAB(0,22);
930 IF m=1 PRINT"    to Quit and re-set
 the Computer."
940 IF m=2 PRINT"    to start again fr
om the beginning."
950 IF m=3 PRINT"to convert from Arabi
c to Roman numbers"'"and vice versa.  If
 the entry starts"'"with a number, the p
rogram assumes an"'"Arabic notation.  If
 it starts with any"'"letter the Compute
r does its best to"'"find Roman 'letters
'."
960 IF m=4 PRINT"to get the Calendar f
or any date from"'"1 January 1 AD to 13
December 9999 in"'"the Roman form.  The
day of the week"'"is also presented (in
English)."
970 IF m=5 PRINT"to watch a demonstrat
ion addition of"'"any three Roman numera
ls of your own"'"choice. If you enter th
e Roman number"'"incorrectly, the Comput
er does the"'"best it can!"
980 ENDPROC
990 :
1000 DEF PROCconvert
1010 VDU19,0,4,0;0;0;
1020 VDU19,1,3,0;0;0;
1030 PROCdouble(128,2,"CONVERT ROMAN/AR
ABIC NUMBERS")
1040 PRINTTAB(13,5)"ESCAPE to Quit"
1050 VDU28,0,24,39,7
1060 REPEAT
1070 M$="":C$="":X$="":I$=""
1080 PRINT'" Enter a Number (Maximum ar
ound 230,000)"
1090 INPUT"   "B$
1100 E%=LEN(B$)
1110 A$=B$
1120 IF VAL(A$)<=0 THEN flag%=0:PROCrom
an ELSE flag%=1:PROCarabic
1130 PRINT'SPC(3);:IF flag% PRINTB$+" =
"+M$+C$+X$+I$ ELSE PRINTB$+" = ";R%
1140 UNTIL Kingdomcome
1150 ENDPROC
1160 :
1170 DEF PROCthousands
1180 E%=E%-3
1190 M$=LEFT$(A$,E%):E%=3
1200 M%=VAL(M$)
1210 M$=STRING$(M%,"M")
1220 A$=RIGHT$(A$,3)
1230 ENDPROC
1240 :
1250 DEF PROCroman
1260 REM"Loop Roman to Arabic"
1270 R%=0:FOR J%=1 TO E%
1280 M%=INSTR(A$,"M")
1290 D%=INSTR(A$,"D")
1300 C%=INSTR(A$,"C")
1310 L%=INSTR(A$,"L")
1320 X%=INSTR(A$,"X")
1330 V%=INSTR(A$,"V")
1340 I%=INSTR(A$,"I")
1350 IF M%=1 R%=R%+1000:m%=m%+1
1360 IF D%=1 R%=R%+500:d%=d%+1
1370 IF (C%=1 AND M%=2) OR (C%=1 AND D%
=2) THEN R%=R%-100:cneg%=cneg%+1
1380 IF C%=1 AND M%=0 AND D%=0 THEN R%=
R%+100:c%=c%+1
1390 IF L%=1 R%=R%+50:l%=l%+1
1400 IF (X%=1 AND C%=2) OR (X%=1 AND L%
=2) THEN R%=R%-10:xneg%=xneg%+1
1410 IF X%=1 AND C%=0 AND L%=0 THEN R%=
R%+10:x%=x%+1
1420 IF V%=1 R%=R%+5:v%=v%+1
1430 IF (I%=1 AND X%=2) OR (I%=1 AND V%
=2) THEN R%=R%-1:ineg%=ineg%+1
1440 IF I%=1 AND X%=0 AND V%=0 THEN R%=
R%+1:i%=i%+1
1450 A$=RIGHT$(A$,E%-J%)
1460 NEXT
1470 S%=S%+R%
1480 !P%=R%:P%=P%+4
1490 ENDPROC
1500 :
1510 DEF PROCadd
1520 CLS
1530 VDU19,0,4,0;0;0;
1540 VDU19,1,3,0;0;0;
1550 PROCdouble(128,2,"ROMAN ADDITION")
1560 PRINTTAB(13,5)"ESCAPE to Quit"
1570 INPUT''"Enter time delay in second
s ",N%
1580 m%=0:d%=0:c%=0:l%=0:x%=0:v%=0:i%=0
1590 mneg%=0:dneg%=0:cneg%=0:lneg%=0:xn
eg%=0:vneg%=0:ineg%=0
1600 FOR P%=&78 TO &70 STEP -4:!P%=0
1610 NEXT:P%=&70:S%=0
1620 VDU28,0,30,39,6
1630 CLS
1640 PROCgrid
1650 FOR K%=0 TO 2
1660 VDU28,2,30,39,25+K%
1670 PRINT"Add the following (";K%+1;")
";:INPUT" ";A$
1680 E%=LEN(A$)
1690 PROCroman
1700 PROCprint(0,4,8,"M",m%)
1710 PROCprint(0,10,11,"D",d%):PROCprin
t(1,10,11,"D",dneg%)
1720 PROCprint(0,13,17,"C",c%):PROCprin
t(1,13,17,"C",cneg%)
1730 PROCprint(0,19,20,"L",l%):PROCprin
t(1,19,20,"L",lneg%)
1740 PROCprint(0,22,26,"X",x%):PROCprin
t(1,22,26,"X",xneg%)
1750 PROCprint(0,28,29,"V",v%):PROCprin
t(1,28,29,"V",vneg%)
1760 PROCprint(0,31,35,"I",i%):PROCprin
t(1,31,35,"I",ineg%)
1770 VDU26
1780 NEXT
1790 PROCdel(N%)
1800 PROCrationalise
1810 VDU28,2,30,38,28
1820 P%=&70
1830 PRINT"That is ";!P%;"+";P%!4;"+";P
%!8;" = ";S%
1840 PRINT" Press any key to do another
 sum."
1850 Q$=GET$
1860 VDU26:PROCadd
1870 ENDPROC
1880 :
1890 DEF PROCdel(n)
1900 TIME=0
1910 REPEAT UNTIL TIME>n*100
1920 ENDPROC
1930 :
1940 :
1950 DEF PROCromanyear
1960 M$="":C$="":X$="":I$=""
1970 E%=LEN(Year$)
1980 A$=Year$
1990 PROCarabic
2000 Year$=M$+C$+X$+I$
2010 ENDPROC
2020 :
2030 DEF PROCarabic
2040 IF E%>3 PROCthousands
2050 ON E% GOSUB 3990,4090,4210
2060 ENDPROC
2070 :
2080 DEF PROCfasti
```

```
2Ø9Ø RESTORE 5Ø9Ø
 21ØØ FOR J%=1 TO 34:READ fasti$(J%):NEX
T
 211Ø FOR J%=1 TO 12:READ Month$(J%):NEX
T
 212Ø IF dd=1 ENDPROC
 213Ø IF S% AND mm=2 AND dd=25 THEN mm =
3:dd=34:ENDPROC
 214Ø IF S% AND mm=2 AND dd>25 THEN mm =
3:dd=dd+4:ENDPROC
 215Ø dd=dd+2
 216Ø PROCpointer
 217Ø ENDPROC
 218Ø :
 219Ø DEF PROCpointer
 22ØØ IF mm=3 OR mm=5 OR mm=7 OR mm=1Ø T
HEN dd=dd-2
 221Ø IF dd<16 ENDPROC
 222Ø IF dd>15 AND (mm=4 OR mm=6 OR mm=9
 OR mm=11) THEN dd=dd+1
 223Ø IF dd>15 AND (mm=3 OR mm=5 OR mm=7
 OR mm=1Ø) THEN dd=dd+2
 224Ø IF dd>15 AND mm=2 THEN dd=dd+3
 225Ø mm=mm+1
 226Ø IF mm>12 mm=1:yy=yy+1
 227Ø Year$=STR$(yy)
 228Ø ENDPROC
 229Ø :
 23ØØ REM"Roman Number Addition"
 231Ø DEF PROCprint(flag%,X1,X2,A$,T%)
 232Ø IF flag% A%=22:B%=18 ELSE A%=15:B%
=11
 233Ø VDU28,X1,A%,X2,B%
 234Ø CLS:IF T%=Ø ENDPROC
 235Ø FOR H%=1 TO T%:PRINTA$;:NEXT
 236Ø ENDPROC
 237Ø :
 238Ø DEF PROCgrid
 239Ø MOVE 25,26Ø:DRAW 1175,26Ø
 24ØØ MOVE 25,48Ø:DRAW 1175,48Ø
 241Ø MOVE 25,7ØØ:DRAW 1175,7ØØ
 242Ø DRAW 1175,24Ø
 243Ø MOVE12Ø,7ØØ:DRAW12Ø,24Ø
 244Ø MOVE3ØØ,7ØØ:DRAW3ØØ,24Ø
 245Ø MOVE4ØØ,7ØØ:DRAW4ØØ,24Ø
 246Ø MOVE595,7ØØ:DRAW595,24Ø
 247Ø MOVE695,7ØØ:DRAW695,24Ø
 248Ø MOVE88Ø,7ØØ:DRAW88Ø,24Ø
 249Ø MOVE975,7ØØ:DRAW975,24Ø
 25ØØ ENDPROC
 251Ø :
 252Ø DEF PROCrationalise
 253Ø REM"IIII
 254Ø PROCreport(4,"I"):PROCdel(N%/2)
 255Ø REPEAT
 256Ø IF i%=Ø GOTO 26ØØ
 257Ø IF ineg%=Ø GOTO 265Ø
 258Ø PROCreport(1,"I"):PROCdel(N%/2)
 259Ø i%=i%-1:ineg%=ineg%-1
 26ØØ IF i%-ineg%<-1:PROCreport(2,"V"):P
ROCdel(N%/2):i%=i%+5:vneg%=vneg%+1
 261Ø PROCprint(Ø,31,35,"I",i%)
 262Ø PROCprint(1,31,35,"I",ineg%)
 263Ø PROCprint(1,28,29,"V",vneg%)
 264Ø PROCdel(N%)
 265Ø UNTIL i%=Ø OR ineg%=Ø
 266Ø REPEAT
 267Ø IF i%=4 THEN i%=Ø:ineg%=1:v%=v%+1
 268Ø IF i%>4 PROCreport(3,"V"):PROCdel(
N%/2):i%=i%-5:v%=v%+1
 269Ø PROCprint(Ø,31,35,"I",i%):PROCprin
t(1,31,35,"I",ineg%)
 27ØØ PROCprint(Ø,28,29,"V",v%)
 271Ø PROCdel(N%)
 272Ø UNTIL i%<4
 273Ø :
 274Ø REM"VVVV
 275Ø PROCreport(4,"V"):PROCdel(N%/2)
 276Ø REPEAT
 277Ø IF v%=Ø GOTO 281Ø
 278Ø IF vneg%=Ø GOTO 286Ø
 279Ø PROCreport(1,"V"):PROCdel(N%/2)
 28ØØ v%=v%-1:vneg%=vneg%-1
 281Ø IF vneg%>v% THEN PROCreport(2,"X")
:PROCdel(N%/2):v%=v%+2:xneg%=xneg%+1
 282Ø PROCprint(Ø,28,29,"V",v%)
 283Ø PROCprint(1,28,29,"V",vneg%)
 284Ø PROCprint(1,22,26,"X",xneg%)
 285Ø PROCdel(N%)
 286Ø UNTIL v%=Ø OR vneg%=Ø
 287Ø REPEAT
 288Ø IF v%>1 PROCreport(3,"X"):PROCdel(
N%/2):v%=v%-2:x%=x%+1
 289Ø PROCprint(Ø,28,29,"V",v%):PROCprin
t(1,28,29,"V",vneg%)
 29ØØ PROCprint(Ø,22,26,"X",x%)
 291Ø PROCdel(N%)
 292Ø UNTIL v%<2
 293Ø :
 294Ø REM"XXXX
 295Ø PROCreport(4,"X"):PROCdel(N%/2)
 296Ø REPEAT
 297Ø IF x%=Ø GOTO 3Ø1Ø
 298Ø IF xneg%=Ø GOTO 3Ø6Ø
 299Ø PROCreport(1,"X"):PROCdel(N%/2)
 3ØØØ x%=x%-1:xneg%=xneg%-1
 3Ø1Ø IF x%-xneg%<-1:PROCreport(2,"L"):P
ROCdel(N%/2):x%=x%+5:lneg%=lneg%+1
 3Ø2Ø PROCprint(Ø,22,26,"X",x%)
 3Ø3Ø PROCprint(1,22,26,"X",xneg%)
 3Ø4Ø PROCprint(1,19,2Ø,"L",lneg%)
 3Ø5Ø PROCdel(N%)
 3Ø6Ø UNTIL x%=Ø OR xneg%=Ø
 3Ø7Ø REPEAT
 3Ø8Ø IF x%=4 THEN x%=Ø:xneg%=1:l%=l%+1
 3Ø9Ø IF x%>4 PROCreport(3,"L"):PROCdel(
N%/2):x%=x%-5:l%=l%+1
 31ØØ PROCprint(Ø,22,26,"X",x%):PROCprin
t(1,22,26,"X",xneg%)
 311Ø PROCprint(Ø,19,2Ø,"L",l%)
 312Ø PROCdel(N%)
 313Ø UNTIL x%<4
 314Ø :
 315Ø REM"LLLL
 316Ø PROCreport(4,"L"):PROCdel(N%/2)
 317Ø REPEAT
 318Ø IF l%=Ø GOTO 322Ø
 319Ø IF lneg%=Ø GOTO 327Ø
 32ØØ PROCreport(1,"L"):PROCdel(N%/2)
 321Ø l%=l%-1:lneg%=lneg%-1
 322Ø IF lneg%>l% THEN PROCreport(2,"C")
:PROCdel(N%/2):l%=l%+2:cneg%=cneg%+1
 323Ø PROCprint(Ø,19,2Ø,"L",l%)
 324Ø PROCprint(1,19,2Ø,"L",lneg%)
 325Ø PROCprint(1,13,17,"C",cneg%)
 326Ø PROCdel(N%)
 327Ø UNTIL l%=Ø OR lneg%=Ø
 328Ø REPEAT
 329Ø IF l%>1 THEN PROCreport(3,"C"):PRO
Cdel(N%/2):l%=l%-2:c%=c%+1
 33ØØ PROCprint(Ø,19,2Ø,"L",l%):PROCprin
t(1,19,2Ø,"L",lneg%)
 331Ø PROCprint(Ø,13,17,"C",c%)
 332Ø PROCdel(N%)
 333Ø UNTIL l%<2
 334Ø :
 335Ø REM"CCCC
 336Ø PROCreport(4,"C"):PROCdel(N%/2)
 337Ø REPEAT
 338Ø IF c%=Ø GOTO 342Ø
 339Ø IF cneg%=Ø GOTO 347Ø
 34ØØ PROCreport(1,"C"):PROCdel(N%/2)
 341Ø c%=c%-1:cneg%=cneg%-1
 342Ø IF c%-cneg%<-1:PROCreport(2,"D"):P
ROCdel(N%/2):c%=c%+5:dneg%=dneg%+1
 343Ø PROCprint(Ø,13,17,"C",c%)
 344Ø PROCprint(1,13,17,"C",cneg%)
 345Ø PROCprint(1,1Ø,11,"D",dneg%)
 346Ø PROCdel(N%)
 347Ø UNTIL c%=Ø OR cneg%=Ø
 348Ø REPEAT
 349Ø IF c%=4 THEN c%=Ø:cneg%=1:d%=d%+1
 35ØØ IF c%>4 PROCreport(3,"D"):PROCdel(
N%/2):c%=c%-5:d%=d%+1
 351Ø PROCprint(Ø,13,17,"C",c%):PROCprin
t(1,13,17,"C",cneg%)
 352Ø PROCprint(Ø,1Ø,11,"D",d%)
 353Ø PROCdel(N%)
 354Ø UNTIL c%<4
 355Ø :
 356Ø REM"DDDD
 357Ø PROCreport(4,"D"):PROCdel(N%/2)
 358Ø REPEAT
 359Ø IF d%=Ø GOTO 363Ø
 36ØØ IF dneg%=Ø GOTO 368Ø
 361Ø PROCreport(1,"D"):PROCdel(N%/2)
 362Ø d%=d%-1:dneg%=dneg%-1
 363Ø IF dneg%>d% THEN PROCreport(2,"M")
:PROCdel(N%/2):d%=d%+2:mneg%=mneg%+1
 364Ø PROCprint(Ø,1Ø,11,"D",d%)
 365Ø PROCprint(1,1Ø,11,"D",dneg%)
 366Ø PROCprint(1,4,8,"M",mneg%)
 367Ø PROCdel(N%)
 368Ø UNTIL d%=Ø OR dneg%=Ø
 369Ø REPEAT
 37ØØ IF d%>1 PROCreport(3,"M"):PROCdel(
N%/2):d%=d%-2:m%=m%+1
 371Ø PROCprint(Ø,1Ø,11,"D",d%):PROCprin
t(1,1Ø,11,"D",dneg%)
 372Ø PROCprint(Ø,4,8,"M",m%)
 373Ø UNTIL d%<2
 374Ø :
 375Ø REM"MMMM
 376Ø PROCreport(4,"M"):PROCdel(N%/2)
 377Ø REPEAT
 378Ø IF mneg%=Ø ENDPROC
 379Ø PROCreport(1,"M"):PROCdel(N%/2)
 38ØØ m%=m%-1:mneg%=mneg%-1
 381Ø PROCprint(Ø,4,8,"M",m%)
 382Ø PROCprint(1,4,8,"M",mneg%)
 383Ø UNTIL mneg%=Ø
 384Ø REM VDU26
 385Ø ENDPROC
 386Ø :
 387Ø DEF PROCreport(T,T$)
 388Ø VDU28,2,3Ø,39,28:CLS
 389Ø IF T=Ø PRINTSPC(2Ø)
 39ØØ IF T=1 PRINT"Cancel negative ";T$;
"'s"
 391Ø IF T=2 PRINT"Borrow from ";T$
 392Ø IF T=3 PRINT"Carry to ";T$
 393Ø IF T=4 PRINT"Check ";T$;"'s"
 394Ø IF T=5 PRINT"Press 'Q' to quit or
any other key."
 395Ø VDU26
 396Ø ENDPROC
 397Ø :
 398Ø REM"Units"
 399Ø I$=RIGHT$(A$,1)
 4ØØØ I%=VAL(I$):IF I%=Ø I$="":RETURN
 4Ø1Ø IF I%<4 I$=STRING$(I%,"I")
 4Ø2Ø IF I%=4 I$="IV"
 4Ø3Ø IF I%=5 I$="V"
 4Ø4Ø IF I%>5 AND I%<9 I$="V"+STRING$(I%
-5,"I")
 4Ø5Ø IF I%=9 I$="IX"
 4Ø6Ø RETURN
 4Ø7Ø :
 4Ø8Ø REM"Tens"
 4Ø9Ø X$=LEFT$(RIGHT$(A$,2),1)
 41ØØ X%=VAL(X$)
 411Ø IF X%=Ø X$="":GOSUB 399Ø
 412Ø IF X%<4 X$=STRING$(X%,"X")
 413Ø IF X%=4 X$="XL"
 414Ø IF X%=5 X$="L"
 415Ø IF X%>5 AND X%<9 X$="L"+STRING$(X%
-5,"X")
 416Ø IF X%=9 X$="XC"
 417Ø GOSUB 399Ø
 418Ø RETURN
 419Ø :
 42ØØ REM"Hundreds"
 421Ø C$=LEFT$(A$,1)
 422Ø C%=VAL(C$)
 423Ø IF C%=Ø C$="":GOSUB 4Ø9Ø
 424Ø IF C%<4 C$=STRING$(C%,"C")
 425Ø IF C%=4 C$="CD"
 426Ø IF C%=5 C$="D"
 427Ø IF C%>5 AND C%<9 C$="D"+STRING$(C%
-5,"C")
 428Ø IF C%=9 C$="CM"
 429Ø GOSUB 4Ø9Ø
 43ØØ RETURN
 431Ø :
 432Ø DEF PROCcalendar
 433Ø PROCdouble(128,2,"CALENDARIUM")
 434Ø PRINTTAB(14,5)"ESCAPE to Quit"
 435Ø VDU28,Ø,24,39,7
 436Ø REPEAT
 437Ø Year$=STRING$(1Ø," "):AUC$=Year$
 438Ø day=Ø:month=Ø:year=Ø:pointer=3:new
yearday=Ø:note$="":Z%=TRUE
 439Ø INPUT'"Enter date as dd,mm,yyyy ";
day,month,year
 44ØØ IF year<1 VDU7:PRINT'"Sorry, BC da
tes crack me up!":GOTO 439Ø
 441Ø IF day<1 OR month<1 VDU7:PRINT'"So
rry, no zeroes":GOTO 439Ø
 442Ø IF year>9999 VDU7:PRINT'"If you ar
e serious, alter FNcentennial.":GOTO 439
Ø
 443Ø Y%=year
 444Ø AUC%=Y%+753
 445Ø Year$=STR$(AUC%)
 446Ø PROCromanyear
 447Ø AUC$=Year$
 448Ø Year$=STR$(Y%)
 449Ø PROCromanyear
 45ØØ RESTORE 5Ø7Ø
 451Ø FOR I%=1 TO month:READ month$:NEXT
 452Ø IF day MOD1Ø=1 AND day<>11 suffix$
="st " ELSE IF day MOD1Ø=2 AND day<>12 s
uffix$="nd " ELSE IF day MOD1Ø=3 AND day
<>13 suffix$="rd " ELSE suffix$="th "
 453Ø PRINT'" ";day;suffix$+month$+" ";y
ear;" AD";
 454Ø dd=day:mm=month:yy=year
 455Ø pointer=pointer+FNreform
 456Ø pointer=pointer+FNcentennial
 457Ø pointer=(pointer+year) MOD 28
 458Ø RESTORE 499Ø:FOR I%=Ø TO pointer:R
EAD newyear$:NEXT
 459Ø IF LEFT$(newyear$,1)="L" THEN S%=1
 ELSE S%=Ø
 46ØØ Z%=FNtrap
 461Ø newyearday=VAL(RIGHT$(newyear$,1))
 462Ø IF S% day=(newyearday+day++VAL(MID
$("Ø34Ø25Ø36146",month,1))-1)MOD7 ELSE d
ay=(newyearday+day+VAL(MID$("Ø33614625Ø3
5",month,1))-1)MOD7
 463Ø IF S% PRINT" (a Leap year)" ELSE P
RINT" (a Common year)"
 464Ø IF NOT Z% VDU7:day=7
 465Ø RESTORE 5Ø6Ø:FOR I%=Ø TO day:READ
d$:NEXT
 466Ø IF year<199Ø PRINT" was ";d$;"day"
 ELSE IF I%=8 PRINT" will not exist." EL
SE PRINT" will be ";d$;"day"
 467Ø PROCfasti
 468Ø IF I%<>8 PRINT'"  ";fasti$(dd);"."
;Month$(mm);". ";Year$
 469Ø PRINT'"  (";AUC$;" Ab Urbe Condita
)"
 47ØØ PRINT'note$
 471Ø UNTIL Kingdomcome
 472Ø ENDPROC
 473Ø :
 474Ø DEF FNtrap
 475Ø IF day>31 THEN=FALSE
 476Ø IF month=2 AND day>29 THEN=FALSE
 477Ø IF S%=Ø AND month=2 AND day>28 THE
N=FALSE
 478Ø IF (month=4 OR month=6 OR month=9
OR month=11) AND day>3Ø THEN=FALSE
 479Ø IF year=1752 AND month=9 AND day<1
4 AND day>2 note$="Date abolished by Act
 of Parliament.":=FALSE
 48ØØ =TRUE
 481Ø :
 482Ø DEF FNreform
 483Ø IF year<4 THEN =12
 484Ø IF year=4 THEN =-5
 485Ø IF year<1752 THEN =Ø
 486Ø IF year=1752 AND month<9 THEN =Ø
 487Ø IF year=1752 AND month>9 THEN =8
 488Ø IF year=1752 AND month=9 AND day<3
 THEN =Ø
 489Ø =8
 49ØØ :
 491Ø DEF FNcentennial
 492Ø Y%=Ø
 493Ø IF year>1799 THEN FOR I%=18ØØ TO y
ear STEP 1ØØ ELSE=Y%
 494Ø IF I% MOD 4ØØ<>Ø Y%=Y%+16
 495Ø NEXT
 496Ø IF year MOD1ØØ=Ø AND year MOD4ØØ Y
%=Y%+17
 497Ø =Y%
 498Ø :
 499Ø DATA C1,C2,C3,L4
 5ØØØ DATA C6,CØ,C1,L2
 5Ø1Ø DATA C4,C5,C6,LØ
 5Ø2Ø DATA C2,C3,C4,L5
 5Ø3Ø DATA CØ,C1,C2,L3
 5Ø4Ø DATA C5,C6,CØ,L1
 5Ø5Ø DATA C3,C4,C5,L6
 5Ø6Ø DATA Sun,Mon,Tues,Wednes,Thurs,Fri
,Satur,"not a "
 5Ø7Ø DATA January,February,March,April,
May,June,July,August,September,October,N
ovember,December
 5Ø8Ø :
 5Ø9Ø DATA Kalendis,VI Non,V Non,IV Non,
III Non,Pr.Non,Nonis,VIII Id,VII Id,VI I
d,V Id,IV Id,III Id,Pr.Id,Idibus,XIX Kal
,XVIII Kal,XVII Kal,XVI Kal,XV Kal,XIV K
al,XIII Kal
 51ØØ DATA XII Kal,XI Kal,X Kal,IX Kal,V
III Kal,VII Kal,VI Kal,V Kal,IV Kal,III
Kal,Pr.Kal,bis VI Kal
 511Ø DATA Ian,Feb,Mar,Apr,Mai,Iun,Iul(Q
ui),Aug(Sex),Sep,Oct,Nov,Dec
```

NOTES

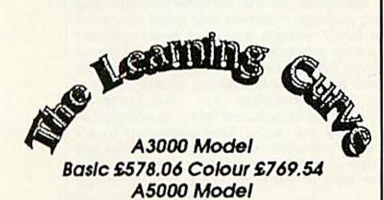
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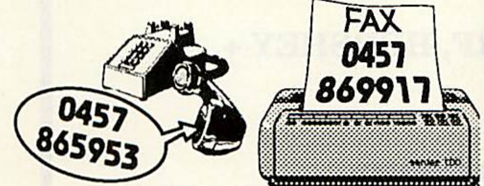
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I SAY, I SAY, I SAY

At last, Hearsay joins the ranks of the Risc OS packages. Ian Burley looks at a communications revamp

Hearsay, a popular comms package for the Archimedes has at last been brought into the nineties. The original version of *Hearsay* was a highly popular comms package for the Arc and now Risc Developments has released the long-awaited update, *Hearsay 2*. Unlike the original, this version is fully Risc OS compliant.

ArcTerm 6, from The Serial Port, was always *Hearsay's* main rival and it was quickly adapted after the arrival of Risc OS, becoming a leading comms package. *Hearsay*, on the other hand, was left untouched until now – a year later. Luckily the long wait has proved worthwhile, beneficial even.

It's clear that the author, David Pilling has benefitted from the *ArcTerm* experience as *Hearsay 2* matches the *ArcTerm 7* specification very closely in many areas and frequently offers improvements.

Most of the failings of the original *Hearsay* have now been corrected. Perhaps the most important addition is the script programming language – a particular strength of the rival *ArcTerm* package. The good news for programmers is that the compact script language provided in *Hearsay 2*, is based on a subset of the object-oriented version of C, called C++.

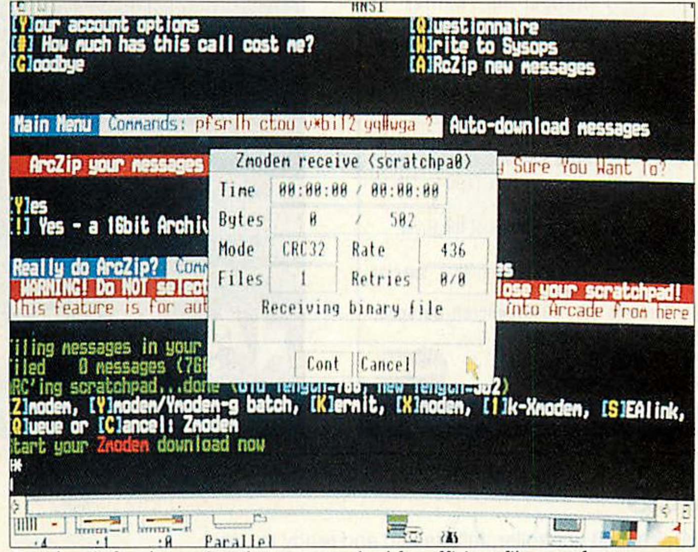
However, the *ArcScript* language found in *ArcTerm 7*, has been used as the basis for many Arc-based bulletin board systems and remains the most comprehensive comms script language with more key words and constructs.

FILE TRANSFER

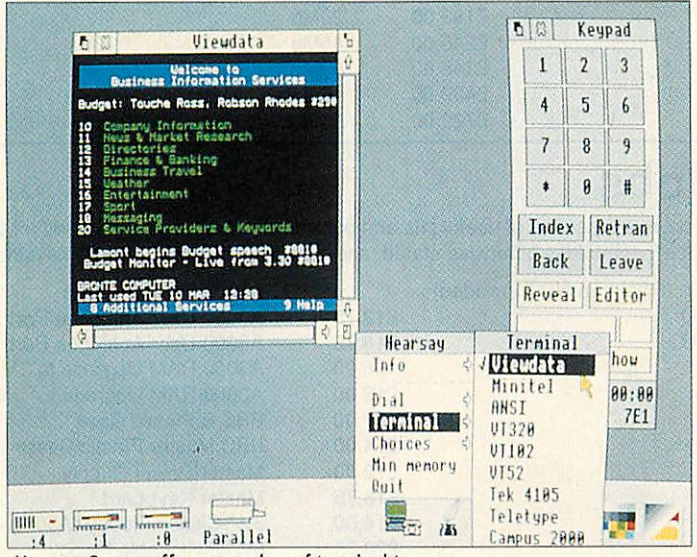
Originally, *Hearsay* was a bit weak on file-transfer selection. This has been rectified with the addition of ZModem and Ymodem-g options. YModem-g offers speedy transfers for batches of files, by switching the error correction off.

This is not quite as daft as it sounds. These days, many modems take advantage of standards like MNP4 and V42 to offer error corrected connections, although they are safer when used on null modem (with direct serial to serial links).

ZModem is rapidly becoming the new standard for efficient file transfers and can also transfer batches of more than one file at a time. In addition, it can adapt to the quality of the telephone connection and changes data block sizes accordingly – the bigger the block, the less error checking needs to be done and the quicker the transfer. Checks are only echoed if there is an error, which saves further time. Older transfer protocols laboriously echo check for every transmitted block.



Zmodem is fast becoming the new standard for efficient file transfer



Hearsay 2 now offers a number of terminal types

Another attraction of ZModem is this. If you select the auto-detect option at your end, the transfer will be automatically initiated by the sender at the other end of the line. Gone are the days of blindly messing about, to synchronise the sending and receiving of a file. Even if you are cut off halfway through a transfer, ZModem is capable of preserving what was already transmitted and resuming where it left off, when the line is reconnected.

ZModem was one big reason for buying *ArcTerm*, but *Hearsay 2* has eliminated that advantage. The other main competitor, namely *ArcComm 2* from Longman Logotron, still does not offer ZModem transfer capability.

Another useful feature of *ArcTerm 7* which has found its way into *Hearsay 2*, is a file transfer batch mode. To set files up for sending, you simply drag their icons on to the terminal emulation window and a batch file contents/status window appears. Incoming files can also be stored in a receive-batch store.

Although it is a simple matter to drag automatically prompted file icons on to their destination directory windows, it's a nice luxury to not have to worry about all that while you are online. With *Hearsay 2* you can download your files, log off and then worry about where to save them at leisure. The transfer progress windows in *Hearsay 2* are particularly

nice. If the chosen method of transfer is one that lets the receiver know the file length and name, they will obligingly be displayed, complete with a bar indicator showing the proportion of transfer completed. Block sizes and the number of block-retries, if any, are also displayed. There is even a bytes per second indicator – great for showing off if you have a really fast modem.

More seriously, the progress window is useful for checking at a glance whether your modem is set-up correctly or if the phone line quality is adequate for efficient file transfers. *ArcTerm 7* users have to make do without the re-try, bar graph and bytes per second indicators.

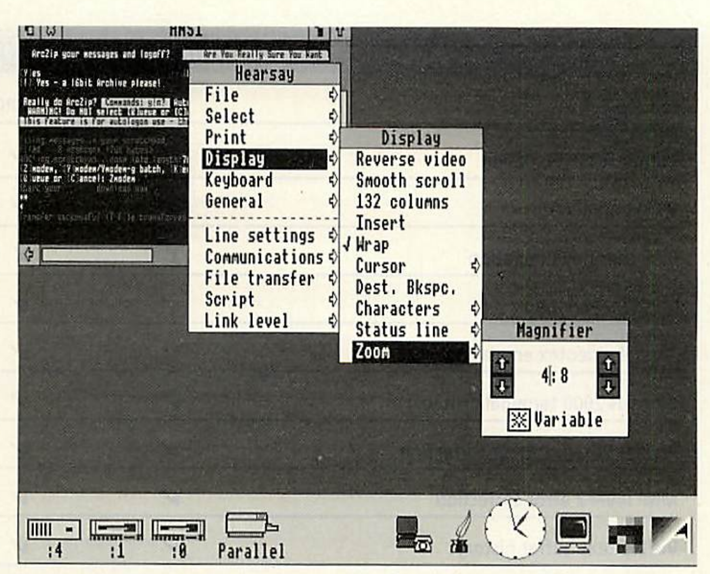
TERMINAL TIPS

If *Hearsay 2* has caught up with the competition on the file transfer front, it has also tried hard in the terminal emulation stakes. For a long time *ArcComm* was the only Arc package to offer an emulation of the French Minitel videotex display standard. *ArcTerm 7* recently added Minitel to its repertoire and it's good to see that *Hearsay 2* has included it as well. The popular service for schools, *Campus 2000*, has just started a Minitel link to French systems.

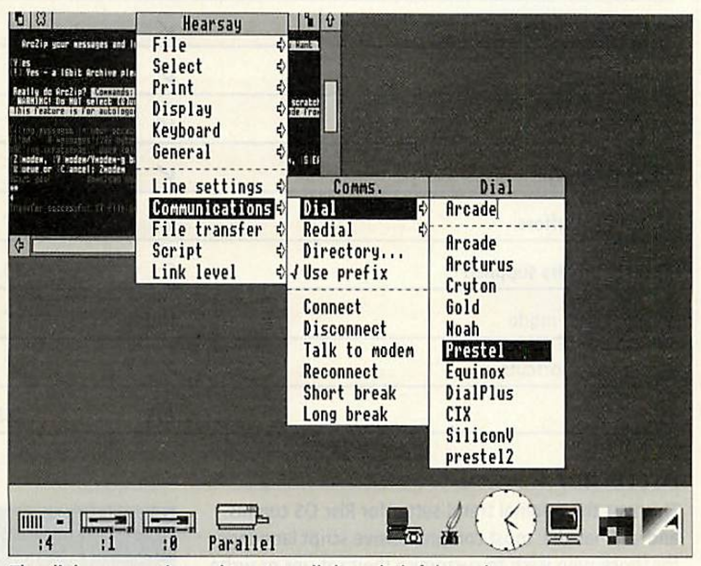
However, neither *ArcTerm* or *Hearsay* can match the *ArcComm* emulation of the very advanced Cept Level One videotex standard, Bildschirmtex, or BTX.

Hearsay 2 has a very slick zooming facility for re-sizing the terminal display window. Where possible the fonts are re-sized along with the window. The effect of, say, a shrunken Prestel window on the Risc OS desktop can be very attractive on the screen and handy too, especially if the screen is already cluttered up with windows.

As for Prestel-style videotex, the *Hearsay* emulation is one of the better ones around. There is none of the jerkiness one associates with *ArcTerm 7* and the excellent full colour alpha-mosaic teletext graphics editor is retained from the original version of *Hearsay*. For those not lucky enough to have an error-correcting modem, basic MNP2 error



Resizing the terminal window is one of the handy features of the program



The dial up menu is used to store all those helpful numbers

correction is provided in software by *Hearsay 2*. Vasscom error correction for *Prestel* is retained from *Hearsay 1*.

ON DISPLAY

One popular feature in the original version of *Hearsay* was the facility to scroll through a screen display buffer and take a second look at the information that zips past too quickly to read. You could also mark sections of the text contained in the buffer and save it on to disc or print it while online.

This facility was sorely missed by those who switched from *Hearsay* to *ArcTerm*. Although later releases of *ArcTerm 7* have a history window option, effectively a separate view of the display buffer, this is clumsy to use and clutters up the screen. *Hearsay 2* provides the scrollable main window and a nice enhancement is that there is a user-definable buffer size.

Word processor functions like text selection, copying and saving are included and like *ArcTerm 7* you can re-send selected text while online – useful for putting a message you have just read into your own reply.

However, *Hearsay 2* has not borrowed all *ArcTerm 7's* clever ideas – one missing feature is a text transmit pad to drag text file icons onto, for immediate transmission. This can be much simpler than loading the text file into a batch buffer and then selecting the send file option.

Moving on, *Hearsay* scores further points over its rivals by providing an excellent telephone number store, plus a log-in macro command facility. *ArcTerm's* is comprehensive enough, but I personally never got to grips with its quirky set-up boxes.

One small note of caution, however. Selecting a host service from the dial menu did prove rather troublesome in the review sample of *Hearsay 2*. Sometimes no terminal emulation was activated after the modem connected, leaving you blind, or the current terminal emulation failed to switch to a required alternative emulation after a different service was dialled. The problem was frustratingly intermittent, but the author of *Hearsay 2* has promised to look into it.

WEAK POINTS

One area where *Hearsay 2* could do well to match *ArcTerm* is in the level of modem driver variety. As standard, *Hearsay* offers the minimum of half a dozen drivers. My version of *ArcTerm*, on the other hand, offers around thirty custom drivers.

Clearly this is because *ArcTerm* has been around longer and more users have had time to customise the drivers, but Risc Developments could have covered a few of the more common modems without too much extra work.

A surprising factor is the lack of keyboard shortcuts for *Hearsay 2* menu options. This ties in with another small criticism I have of *Hearsay 2* – a less than ideal Risc OS menu structure. *ArcTerm* is well stocked with handy shortcuts, which I have grown to depend on increasingly.

Fair enough, the *Hearsay* scripts can program the function keys, but no function key labels are supplied and it is just not as convenient as proper short-keys which are actually labelled on the Risc OS menus themselves.

Both *ArcTerm* and *Hearsay* offer host modes enabling people to log into your Arc as though it were a cut-down bulletin board. The problem is that *Hearsay's* host program takes the term 'cut-down' to its limits. *ArcTerm's* host mode is pretty comprehensive, not just a separately lashed up script program like *Hearsay's*. It has its own menu and is ideal for maintaining access to

one's files at work. This is one reason why *ArcTerm* remains on my own personal hard disc.

SUMMARY

It took a long time coming, but the new Risc OS version of *Hearsay* was well worth the wait. Notable features that *Hearsay 1* users had to do without, such as Zmodem file transfer, Minitel terminal emulation, a built-in script programming language and most important of all, Risc OS desktop compliance, have all been fixed in *Hearsay 2*.

The program isn't perfect, but its strengths outweigh the fact that some minor rival features are missing. See our table opposite for a summary of the features provided with the various packages.

Like most comms packages for the Arc, the Risc OS menus look as though they could be planned a bit more sensibly. On the other hand, the *Hearsay* manual is an excellent example of thoroughness and clarity. The only real blots in the *Hearsay* copy book are the lack of menu short-keys and a function key strip, plus the half-hearted host program.

I like *Hearsay 2* enough to use it in preference to the already excellent *ArcTerm 7*. *Hearsay* is easy to use and much easier to set up than *ArcTerm*. The latter has lost many of the advantages it had over the original version of *Hearsay* and in some areas *Hearsay 2* sets new goals.

Hearsay 2 is a very good communications package and is thoroughly recommended but there is still room for improvement.

PRODUCT DETAILS

Product: Hearsay 2
Version tested: 2.08
Supplier: Risc Developments
Tel: (0727) 40303
Price: £75 + VAT (upgrade, £35)

Product: ArcTerm 7
Supplier: The Serial Port
Tel: (0749) 670058
Price: £68 + VAT

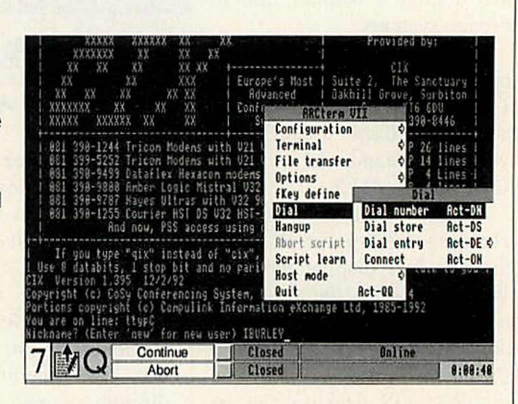
Product: ArcComm 2
Supplier: Longman Logotron
Tel: (0223) 42558
Price: £59 + VAT

THE COMPETITION

FEATURE	HEARSAY 2	ARCTERM 7	ARC-COMM 2
Colour ANSI emulation	✔	✔	✔
VT102 emulation	✔	✔	✔
Bildschirmtex emulation	✘	✘	✔
Minitel emulation	✔	✔	✔
Prestel videotex emulation	✔	✔	✔
Campus 2000 terminal protocol	✔	✔	✔
Prestel Vasscom error correction	✔	✔	✔
MNP level 2 error correction	✔	✔	✘
Visible text buffer history	✔	✔	✘
ZMODEM transfer	✔	✔	✘
YMODEM transfer	✔	✔	✔
Kermit transfer	✔	✔	✘
XMODEM transfer	✔	✔	✔
Script language	✔	✔	✔
Batch file buffers	✔	✔	✘
Modem drivers supplied	6	30	12
Integral host mode	Utility	✔	✘
Menu key-shortcuts	✘	✔	✔
Price	£75	£68	£59

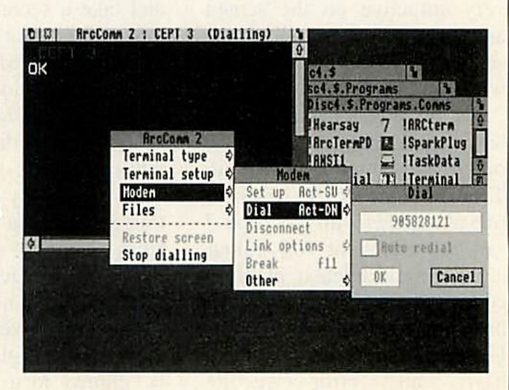
ArcTerm 7

This was the original trend-setter for Risc OS comms. and still has the most comprehensive script language for those who wish to customise their set-ups or write host systems. Quite a selection of utility programs have been written for ArcTerm, including things like secure print protocols for professional videotex users. The program shows its age in some departments compared to Hearsay 2. It has a quirky dial store menu but excellent modem driver support. For me a big plus over Hearsay is the inclusion of menu key-shortcuts. There is a very handy built-in host mode and is still the only Arc comms package to play sound samples. Overall, it needs some revisions but will probably remain the favourite among comms groupies.



ArcComm

This no-frills comms package is aimed squarely at the education market. It is very competitively priced and features a procedure-based script language and, unique to the Arc, an automatic procedure routine creation facility. There are excellent viewdata, Minitel and BTX emulations but the confusing dual icons on the icon bar are unconvincing. It lacks advanced file transfer modes like Zmodem and even the old war-horse Kermit. Besides the advantages of Bildschirmtex (for the few who need it) and a very affordable price, ArcComm doesn't really compare with Hearsay or ArcTerm. A safe bet for those who want a relatively uncomplicated comms solution, but otherwise disappointing.



BY THE **BOOK**

Jerry Glenwright looks at two new Archimedes DTP books

BUDGET DTP ON THE ACORN ARCHIMEDES

Author: Roger Amos
Price: £12.95
Publisher: Dabs Press

Budget DTP on the Acorn Archimedes, by Roger Amos, is aimed at those with an itch to publish, but without the necessary software to scratch it. Assuming that every Archimedes owner has a copy of *Draw* and *Edit* at their disposal, this book describes how to get the most out of the bundled software suite, in order to produce quality publications.

The book begins with a readable account of the rise of electronic publishing and a comprehensive explanation of the steps involved. Although many computer users have a basic understanding of the procedures involved in DTP, not everyone is familiar with the underlying principles – just how does a printed page make it into a book or magazine? Following this, Amos throws caution to the wind and readers are plunged straight into a publishing session at their keyboards. The book gives a step-by-step guide to configuring the Archimedes and its software, installing the applications, creating work disks, setting cache sizes, importing processed text from *Edit* into *Draw,* and so on. The reader should end up with a single page publication.

Having satisfied any burning publishing desires, the author returns to the theory of DTP and describes in detail both *Edit* and *Draw*, proper page layout, and how to use outline fonts and special effects, such as reversed-out text. Additional chapters provide an introduction to printers and printer drivers, sprites and clip art, and some advice on where to go from here.

This release should appeal to many Archimedes owners. Perhaps it *is* rather free with its definition of quality, but this is still a book that any impoverished but enthusiastic publisher, should not be without.



DESKTOP PUBLISHING ON THE ARCHIMEDES

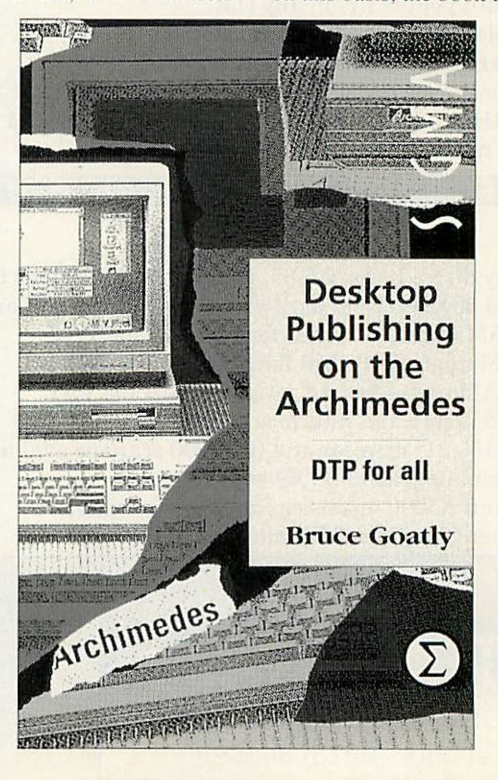
Author: Bruce Goatly
Price: £12.95
Publisher: Sigma Press

Bruce Goatly obviously has great faith in his Archimedes as a DTP machine. And his book, *Desktop Publishing on the Archimedes* is an attempt to convince others likewise.

It begins with a history of desktop publishing but, rather than using the bright-and-brash approach of Roger Amos, Goatly's potted history reads like the transcript of a late-night Open University course. The author then goes on to provide a painstaking explanation of the terminology associated with publishing, including measurements, typefaces and paper sizes.

For those who haven't yet made a commitment to hardware or software, there is a chapter devoted to making the right buying decisions and, instead of appearing to be awed by the technology, the author, at last, asserts himself by telling you exactly what to accept and reject. And then, finally, to desktop publishing. He begins with details of how to use word processors, such as *1st Word Plus* and *Easi-Writer,* for basic design work, and goes on to full-blown DTP packages, including *Ovation* and *Impression,* to produce complete publications. Additionally, there are details of how to make use of imported graphics and processed text and a whole chapter dedicated to using *Edit* and *Draw*.

Although comprehensive, Goatly's work suffers from its rather serious treatment. What he seems to forget is that, although the tools are capable of producing some startling results, the users are rarely graphic designers and are probably tinkering with DTP on a part-time basis. Bruce Goatly attempts to convince by prodding with a forefinger, rather than simply instructing with friendly encouragement and, on this basis, the book fails.



PRODUCED by The Fourth Dimension .... THE Acorn Games Specialists

Pandora's Box





"State of The Art Arcade Adventure"

An intriguing blend of classic puzzles and full-blooded arcade action. Over 200 screens of stunning artwork and game play of the highest quality will appeal to the dedicated adventurer or arcade fanatic.

Prologue

Since ancient times a fastened box has symbolised the danger of our curiosity. This box has been opened and an entire kingdom has been poisoned by the evils unleashed.

The beast that lurked within is free and seeks the souls of men, possessing them and devouring them at will. Feeding upon misery, it profits by treachery and corruption, and in doing so brings the burden of its evils upon the land.

As the finest sorceror in the kingdom you must overcome the black magic and confine the curse once again to the only dungeon strong enough to contain such furious depravity - Pandora's Box.

Quest

The powerful Panmetric graphics system allows you explore complex rooms and stunning landscapes whilst still having plenty in reserve to handle frenzied battles.

At first only armed with a keen wit you must acquire knowledge and magical weapons as the adventure gives way to arcade action. Exploring the length and breadth of the land you could conquer a world of magic or die in obscurity.

Technical Information

Frame Rate	25 FPS
Object Code	150k of Handwritten Arm Code
Graphics	Over 1000 sprites totalling 3Mb of graphics
	256 colour, mode 13 graphics
	Panmetric graphics system
Sound	Digitally sampled sound effects

Reviews

"After 2 years of development and work of 4 programmers The 4th Dimension have released yet another blockbusting game." State of the Arc, Jan '92.

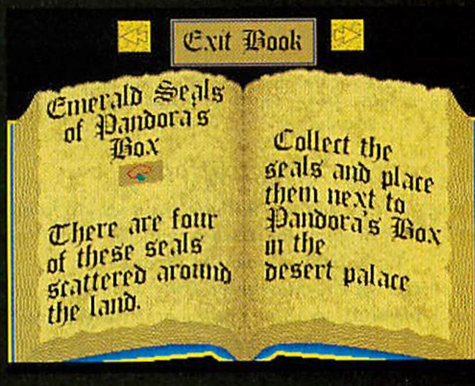
"The graphics are wonderfully detailed and colourful, there is action, adventure, puzzles, intrigue and platform action. With Enter The Realm and now Pandora's Box, The Fourth Dimension is giving you the games you always knew your Archie could play....Simply marvellous." Archimedes World, Feb '92.

"Set in over 200 locations the game is big. There's enough here to keep even the most hardened adventurer busy for days on end....I would rate it as the best arcade adventure around for RiscOS computers." Acorn User, Feb '92.

"This is definitely the best arcade adventure on the Archimedes. Fans of the genre will love it." Syracuse, Issue 5.

Acorn A3000, A5000 & Archimedes Price: £24.95





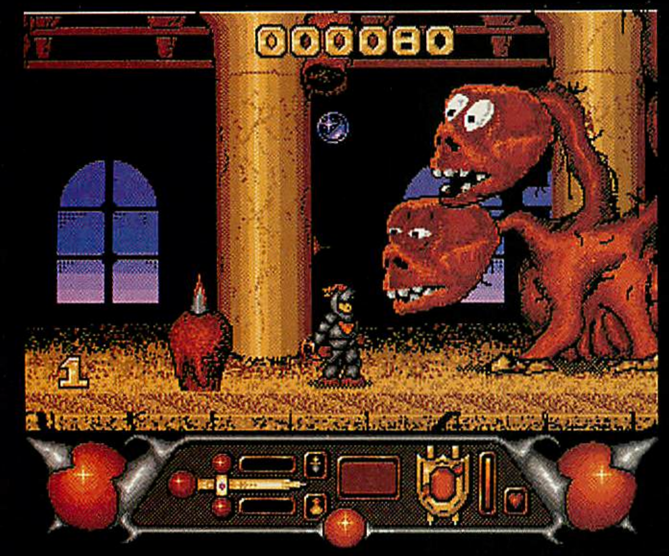






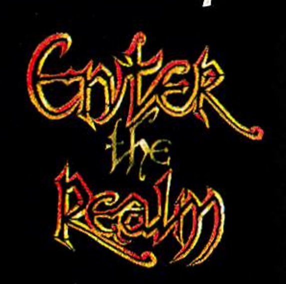
PRODUCED by The Fourth Dimension .... THE Acorn Games Specialists

Enter The Realm





"A Superfast Adventure into Arcade Action"



Combining fast arcade quality action and graphics with the element of adventure and surprise. Meet strange characters, build up your weapons and eventually meet evil in mortal combat.

The Background

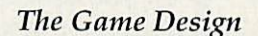
Travel back to Karidor, a land lost in antiquity. A land of evil, a land of good. A land where almost anything can happen and probably will. A land of magic and a land of beauty. So your quest begins.....

The land of Karidor was a quiet world much like Earth. It had mountains, it had seas. It had forests and it had deserts. Even the people were similar, but one thing was different. This was the fact that magic did exist there.

For many aeons the land was untroubled by any great power until one fateful day where everything changed and evil took control. Evil had always existed of course, but had been in balance with the good of the gods, who were neutral. That day however, the balance was tipped.

It turned out that the ancient prophecies of Karidor had proclaimed this event thousands of years ago. The prophecy stated that evil would overthrow the Realm and only one man, a knight of goodly heart and fearsome ability could reset the balance again. The knight was named Kharas.

Enter the Realm challenges you to lead Kharas in his conquest against evil. On the way, dangers will befall you and surprises will await you...



The Game Design

Enter the Realm is the first game to feature true parallax scrolling on the Archimedes and A3000 computers. The whole play area is created from layers which slide over each other creating a true 3 dimensional backdrop upon which the game proceeds.

The game features fast spectacular graphics which are all hand drawn and realistic digitised sound effects and speech which are totally interactive with the action all around you. Everything else in the game will be left as a suprise!



Specifications

Over 2 megs of high quality realistic graphics, all hand drawn.
Over 130k of in-game digitised sound effects and speech.
Over 150k of music by Peter Gillet.
50 frames per second arcade quality scrolling, animation and movement.
6 layer FULL parallax scrolling of play area (forget immitations!).
Massive sprites.
Realistic weather effects and intelligent adversaries.
Control via keyboard or RTFM joystick.



Acorn A3000, A5000 & Archimedes Price £24.95

Reviews

"This is a great game with excellent graphics, sound and playability and, at £24.95, surely makes it the next game to get and probably the best game for the Archimedes to date." Archive, February '92.

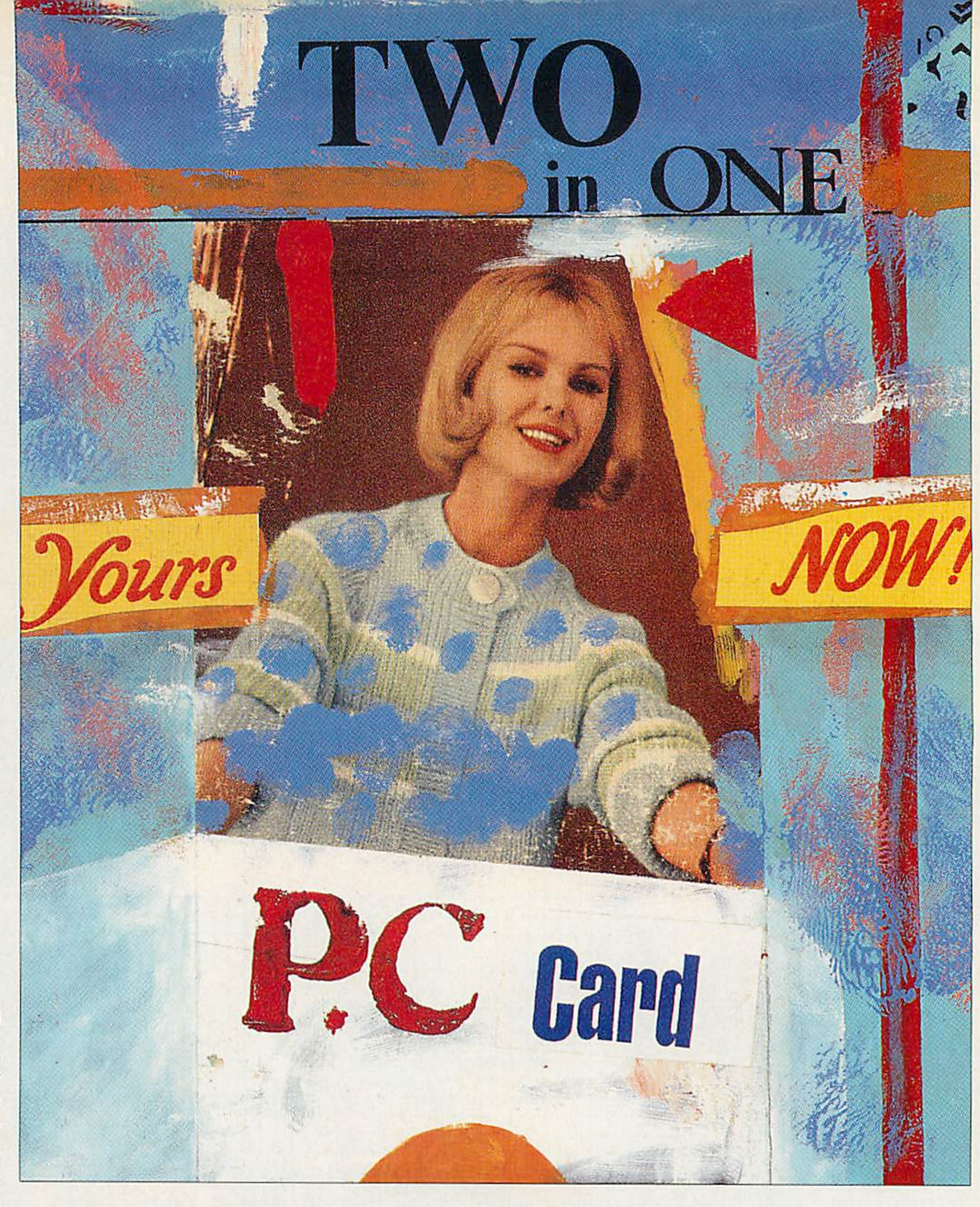
"... it is very addictive and possibly the best arcade game yet from The Fourth Dimension." Syracuse, Issue No. 5.

"The graphics of the game are superb, featuring very large sprites... Enter The Realm is a fantastic game and I personally love it." State of the Arc, Nov '91.

Reviews

"The graphics, scrolling and animation are outstanding .... Enter The Realm is quite simply the best arcade game ever released for the Archi." Archimedes World, January '92.

"This game is undoubtedly the most advanced and sophisticated game for the Arc. It once again demonstrates The Fourth Dimension's commitment to producing games of an ever increasing quality. They continue to try and push the Arc to its limits. At just £24.95 it is remarkable value for money. Buy this one, it's a winner." Micro Computer Mart, December '91.



Malcolm Brown checks out Aleph One's PC expansion card

THE PC INSIDE YOUR ARC

The A5000, launched last year, was the closest Acorn has ever come to producing a PC-compatible computer. With its three-box design and new Acorn *PC Emulator*, Acorn managed to avoid cutting itself off from the PC world.

Acorn's *PC Emulator* is, of course, a software solution to running PC applications on the Archimedes. Now, Aleph One has launched the first hardware alternative, the new 386 PC expansion card, offering the advantages of additional speed and compatibility.

WHY BOTHER?

For right or wrong, IBM PC-compatible computers are the most popular in the world. Up against such odds, the entire Acorn family seems somewhat small. That is not to put down the Archimedes, but it is rather like comparing a Ferrari with a Ford Escort.

For all the Ferrari's performance and desirability, there are a lot more Ford Escorts on the road. Like Escorts, PCs are a self-sustaining miracle – people buy them because everyone else does. But, for all their popularity, there isn't really very much to get excited about in PCs.

They are not based on Risc processors, they don't have a graphics user interface, or even a mouse as standard – and, they certainly don't include excellent packages like Draw, Paint and Edit in the price. But, although the Archimedes offers vastly more power for your money than a PC-compatible, it cannot compete against the sheer popularity of the PC.

Software plays a big part too. About five years ago, IBM promoted the PC range with advertisements which related how every five minutes, somewhere in the world, a new application was being written for the PC. Today, they can't even count them anymore. To be able to lock into the PC world therefore opens up your Archimedes to a vast array of applications not available in the Acorn marketplace. It also allows you to run software you might use in the office on your Archimedes at home. Additionally, often educational establishments use both Acorn machines and PCs and the ability to cross-fertilise would appeal to many.

What the Aleph PC card can offers is, in effect, a PC within your Archimedes. This allows you to run any PC

application and at the same time take advantages of Risc OS programs such as *Draw* and *Edit*.

DESIGN

The 386PC is designed to be most of a PC-compatible nestling inside your Archimedes. On board is a 20MHz 80386SX processor, 1Mb of Ram, Rom Bios, a full VGA display driver, parallel and serial ports and, of course, all the interfacing to the Archimedes. For all that, a 386PC board is the standard 10cm x 16cm half-width podule size, which fits into any vacant slot inside an A300, 400, 500 or 5000 series machine, or on to the back of a BBC A3000.

Aleph One has done an excellent job – the board is extremely well designed and made. Apparently there are over 1200 holes in the board and during design it 'broke' the PCB design program. It is probably the most complex podule ever made.

There are nice touches included in the design which most users would never realise – for instance, the motherboard control chip is designed for laptop computers. It runs the 386PC, but uses almost no power at all when it is not actually being accessed, thus saving the hard-working Archimedes power supply.

Also included with the card is a disc with the applications software. Aleph One has developed the 386PC with a certain amount of blessing from Acorn and the software runs in conjunction with the *PC Emulator*. If you already use the latter, switching to the 386PC is that much easier. If you don't, then you will need to purchase a copy in order to use this expansion.

IN ACTION

The 386PC operates in a similar way to the second processors, that proved so popular for the BBC micro. The expansion board provides the PC processor and memory, while the Archimedes is used as the keyboard, display and disc drive controller.

However, unlike the old second processors, with this expansion you can access the attractions of both systems at the same time. It's like adding a complete PC to your Archimedes. As far as memory goes, the 386PC has just 1Mb Ram – not a lot by today's standards. Most 80386SX PCs have at least 2Mb fitted, and many have 4Mb. The 386PC card can be upgraded to 4Mb or indeed you can buy a 4Mb version. The extra memory is likely to be useful if you want to use the popular *Windows* environment on a PC. When it comes to display technology, the 386PC connected to an Archimedes is, as you would expect, up there with the best of them. Although a few enhanced versions are around, VGA is the standard today and much software requires it. The 386PC can pretend to have a MDA, CGA, EGA or VGA, so it can cope with just about anything. All display modes use Archimedes Ram for screen memory (about 256K of Archimedes Ram is used by the 386PC) but the EGA and VGA modes require the use of an extra 256K, so don't try to use these with an A305.

What is most impressive is the way in which this cross-system display link is so cleverly handled by the 386PC software – even PC games, which poke directly to screen memory, run on this PC

THE PRICE WAR

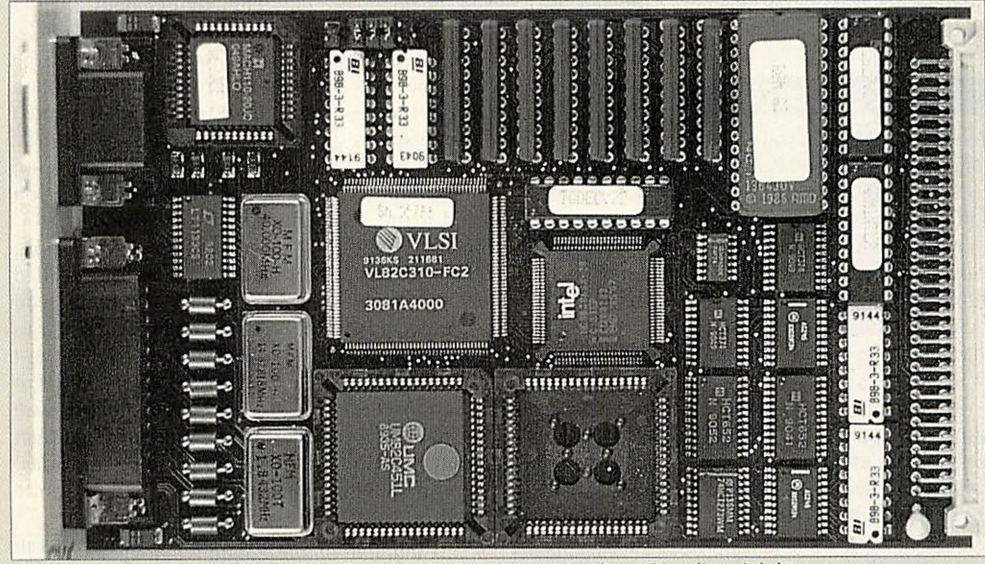
PC prices have been in free-fall for some time now, the drop encouraged by stiff foreign competition and a recent growth in the mail order PC market. So at £495 plus £100 for the PC emulator, is the PC386 card really a bargain?

You can get a real 386 PC with a reputable badge and comparable performance to the Aleph One card – with keyboard, VGA graphics, monitor and 40Mb hard disc for around £1000. Shopping around for a no-name clone could knock £200 off this. There again, insisting on a real IBM could cost over twice as much.

In short, you certainly wouldn't buy an Arc solely to run PC software. But, if you already have an Arc, then the Aleph PC card is cheaper than the alternative of purchasing a whole new machine. Plus it gives you the advantage of easy data transfer between the PC and the Arc worlds – particularly with Risc OS 3.

We will be conducting an in depth comparison of the Arc with other computers in next months' issue of BBC Acorn User.





Which one is better value for money: the PC card (above) or the 'real' machine (top right)?

UNDERSTANDING THE PC

It is perhaps a good idea to explain exactly what an IBM PC-compatible computer is, and where in the large family of such machines the 386PC fits.

The original IBM PC was extremely simple but, as additional items became 'standard' equipment and as the basic hardware improved, the family has grown ever more complex. The biggest changes have been to the microprocessor, the memory and the display – in fact, there is very little common ground between the first PCs and the latest models, except that all software that could run on the early machines can still be used on the latest generation of PCs.

A succession of processors has been used – 8088, 8086, 80286, 80386SX, 80386DX, 80486SX and 80486DX – each faster and more powerful than the last. The 386PC uses the 80386SX processor.

Although the 80386DX is a 32-bit processor (like the Arm in the Archimedes), the 80386SX version uses a 16-bit data bus to communicate with the outside world. This slows it down but makes it cheaper to produce. The 80386SX is the most popular PC processor around at the moment and is widely recognised as the minimum for real business use, although machines with the old 8088 are still sold to this day.

Aleph One could have considerably increased the power of the 386PC by using a 80386DX or even a 80486, the latest in the line of PC chips from Intel, but this would push up the price considerably and also increase the complexity of the hardware.

As it is, various tests applied to the 386PC (including the near industry standard Norton benchmarks) puts the Archimedes/386PC combination at around ten times the speed of the original IBM PC. This is about the same speed as a 'real' 20MHz 80386SX machine.

The 386PC can be made more powerful by adding a 80387SX maths co-processor (it just plugs into a vacant socket on the card) which will take over some of the heavy duty maths work from the processor and speed things up. This will cost you around £120 extra.

THE PC EMULATOR

To run the 386PC card you will also need the Acorn PC Emulator.Many people will have this software already – it is supplied as standard with all Learning Curve machines, except the A3000. But if you do need to purchase the emulator, this will add almost £100 to the overall cost of the setup.

Of course the PC Emulator can also run PC applications, in isolation, without using the 386PC card at all. However, on its own, the emulator runs very slowly. This is fine for tweaking the odd Lotus spreadsheet, but for any serious PC work you will probably be better off with the card. The other advantage of adding the 386PC card, is that it allows you to run dongled PC software., which is not possible using the PC emulator in isolation.

Acorn has recently released version 1.8 of the PC Emulator, priced at £99. The latest version offers many improvements that make it a more viable choice – for more details turn to our news story on page seven.

expansion. In fact, all the software that we tested ran on the 386PC. The 386PC also sports a parallel and serial port on its back plate for connection to printers, modems, and so on.

Since the Archimedes Centronics port is not a two-way interface (as some PC hardware requires – especially applications dongles) data for printing cannot be simply directed through the Archimedes. However, the next version of the software should allow the PC's second parallel port to be specified as the Archimedes' printer port, so you won't have to keep unplugging your printer. Similarly the Archimedes serial port is not quite capable of emulating a PC's, so a dedicated PC port is provided – but the next software release will allow use of the Arcs' port.

One thing that is missing is sound. Simple beeps (Ctrl-G) are intercepted and dealt with. Games sound effects are not, although there is the possibility of linking the PC sound output directly to the Archimedes' sound input. However this is not brought out to the podule backplane, so a flying lead to the main board is required. That aside, the 386PC knits into the Archimedes very elegantly.

THE SOFTWARE

The 386PC we reviewed is a pre-production model. The hardware is in its final form, but the software still has a few bugs to be ironed out and Aleph One is consulting with Acorn on this.

The software supplied is in the form of an application, *386PC*, complete with a PC-like icon. This is installed on the icon bar in the normal way and, with the early version of the software reviewed, a double-click on the icon puts the Archimedes into PC mode.

In the next release, Aleph One promises that this application will open a desktop window and this is where the the 'screen' of your PC will live. For the moment, however, the *386PC* 'takes over' the whole machine.

From this point onwards, it is just like using a 80386SX PC. The *386PC* does a little check of itself, as do all PCs, and asks for a Dos disc to be inserted. Pressing BREAK (not a key used on PC keyboards) brings control back to the desktop and a single click on the *386PC* icon returns you once more to PC mode.

Like any Risc OS application, *386PC* can be installed several times, but since you only have one card attached to the Archimedes, you can't have several PCs running at once – although the software does have the interesting effect of maintaining in Archimedes' memory the PC screen from a previously-enabled PC icon.

A file called Config lurks in the *386PC* application and this controls the type of PC you have. It is a simple Ascii text file of various 'switches' and can be altered with any text editor, such as *Edit*, and re-saved. Any changes will only affect the *386PC* when it is first installed on the icon bar, so it is sensible to think carefully about what you really want, before you launch into a heavy PC session.

The display mode used is selected here, as is the number and name of any hard discs used and whether you have a 80387SX co-processor. Other switches enable a complex debugging system for software development or tracing faults in the 386PC itself.

The 386PC uses the Archimedes' floppy disc drive and discs must be in PC format to work. Your hard disc, of course, must be shared and *386PC* follows the *PC Emulator's* lead of sectioning part of your hard disc and formatting that partition of the disc in IBM style. As far as the 386PC is concerned, you just have a small hard disc – the switch in the Config file gives the pathname to that section of the whole disc.

Also supplied is a mouse driver. This makes the Archimedes' mouse appear like a PC bus mouse, when the file is copied across to your PC Dos disc and included in the startup Autoexec.Bat file.

CONCLUSION

There is no denying the cleverness of the 386PC hardware, nor the ingenious way in which the software integrates the expansion into the Archimedes environment. But is it really all worth it?

For a price not too far removed from that of the 386PC card you could actually buy a complete 80386 PC computer with keyboard, case, power supply, disc drive and so on. However, the 386PC is more than just a PC. This expansion doesn't just give you a PC that fits inside your Archimedes. It manages to combine the two systems into one whole that is greater than the sum of its parts.

Whether loyal Archimedes users like it or not, PCs are here to stay. Many people need to use PC software in certain situations, but prefer to use the Arc. The 386PC allows Archimedes user to tap into the PC world, while remaining true to their own machine.

PRODUCT DETAILS

Product: 386PC card
Supplier: Aleph One, The Old Courthouse, Bottisham, Cambridge CB5 9BA.
Tel: (0223) 811679
Price: £495 for 1Mb version, £625 for 4Mb version
Machines: All Risc OS machines

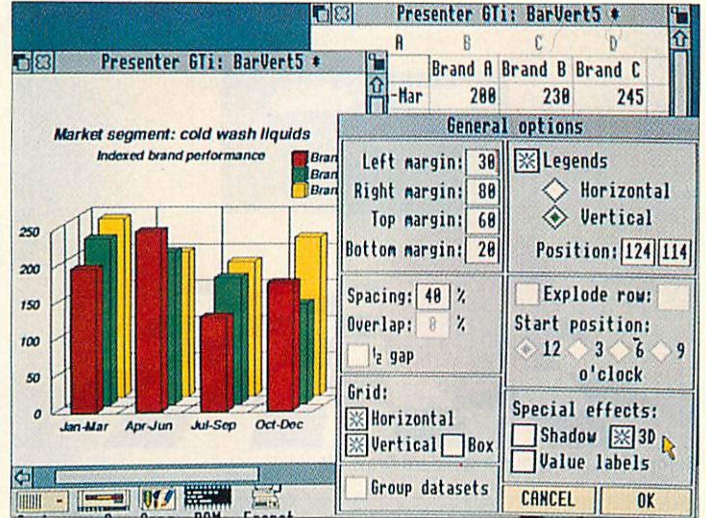
FROM PAST TO PRESENTER

Graham Bell looks at the souped-up version of the graphs application Presenter

Hot on the heels of *Chartwell* and *Graphbox Professional* comes a revised *GTi* version of the other established charting application, Lingenuity's *Presenter*. Like the other two, it converts an array of numbers into a graph or chart which can be exported to *Draw* for presentation purposes. But the re-engineered *'GTi model'* sports a number of features not found in competitive packages.

Presenter GTi is installed on the icon bar and a click of the mouse opens a small grid of blank cells. You can then load the results of calculations from any Risc OS spreadsheet package by dragging in a CSV (comma separated value) file, either onto the *Presenter GTi* icon, or into the data window. Usefully, if you drag into the editing window, you can load at a specific place – perhaps overlaying new data onto existing labels.

Data editing is rudimentary, being limited to removing or copying rows and columns, or altering individual data cells. But uniquely among the three main charting applications, you can transpose arrays – via an option to load CSV files either vertically or horizontally. Also new is the ability to work on several sets of data and different graphs at the same time.



Presenter GTi sets the options for a stacked 3D bar chart

GRAPHICAL MENUS

Once the data array is correct, you can choose one of five main types of chart from the main menu: bar charts; line, area or pie charts; or scattergrams. Each main option leads to a set of sub-types. For example, there are eight options for bar charts : horizontal or vertical bars, with related data bars either adjacent or overlapped, or stacked bars with absolute or proportional scaling. For pies, you can have one or all segments exploded, and have each one labelled with its numerical value. These options are shown using small chart icons rather than the wordy descriptions of *Graphbox's* graph type menu. It is a departure from the norm, and it works in this case, because the graphics are limited to specifically visual options.

As with the previous *Hotlink Presenter*, you can set up a dynamic link between *GTi* and Colton Software's *Pipedream*. This allows the data and graph to be updated automatically whenever the original numbers in the spreadsheet change. There is also a 'warm link' option, which remembers where the original numbers came from in the spreadsheet, but only updates the graph when required.

There are also all the usual options for altering the colour of the data points, lines and pie sectors, and you can add a grid, title, subtitle and axis labels. The axes can be linear or logarithmic, and you can adjust the minimum and maximum limits or leave *Presenter* to do it for you. For some charts, you can add a least-squares line of best fit.

The same typeface and size is used for all the text on the chart, but there is a dialogue (strangely reminiscent of *Schema*) so that you can choose from any available in your system.

Once the graph type is chosen, the graph is drawn and can be saved as a *Draw* file. Also, the data can be saved along with the details of the graph in a *GTi* file. This isn't directly compatible with previous *Presenter* files, but an application is included to translate old files into the new *GTi* format.

Unlike *Chartwell* and *Graphbox Pro*, there is no help in producing a series of similar graphs, no style sheets nor a way of storing graphs without any data. Each of the required options needs to be set up for a new data set, and this is lost if you load any new data. This is a shame: consistency can only be guaranteed by editing the saved *GTi* files to patch new data on to the end of an old file. The application should offer some kind of help in doing this.

In the graph window, you can drag the key to a new location. It is the key that you're most likely to want to move, but it is strange that you cannot move the titles or axis labels this way. Once exported to *Draw*, of course, anything can be changed – so you can alter the font used for the titles, for example, and everything will be grouped in a convenient way to make editing the drawing easy.

A few minor bugs were still in the review version 1.10 – for example, it kept running out of memory for no good reason. Data could not be dragged into *Edit* directly, but saving to disc and then loading into *Edit* worked. And data sets starting at one on the x-axis were not dealt with correctly on area graphs. However, these problems should be quickly ironed out.

CONCLUSION

Presenter GTi sits in the niche between the basic *Chartwell* from Beebug, and the more scientific *Graphbox Pro* from Minerva. But whether it fills the niche, and whether this niche is more than tiny, is hard to say. *GTi* offers no significant advantage over *Chartwell*, barring the latter's positive numbers only limitation, and for new buyers it costs more. Unless you are upgrading from an older version of *Presenter*, it isn't such a hot choice.

PRODUCT DETAILS

Product: Presenter GTi
Supplier: Lingenuity
Tel: (0986) 85477
Price: £69.95 plus VAT
Upgrade price: £30 to £45

ALL CHANGE

Rob Miller shows you how to change colours with the latest package from 4Mation

Imagine that you have a *Draw* file, made up of many shapes, and you want to change the colour of one of them. Using *Draw*, you would have to isolate the shape to be changed, which can be fiddly, then go through the menu system to change the colour.

Chameleon 2 from 4Mation is an application designed for the purpose of colouring *Draw* or *Poster* files and allows colours to be changed simply and quickly by just pointing at the shape to be altered. As well as having their colours changed, areas can be lightened, darkened or converted from colour to grey scale.

To use the application *Draw* or *Poster* files can are dragged on to the *Chameleon 2* icon for alteration. The toolbox is displayed, plus a window showing the *Draw* file that you wish to change.

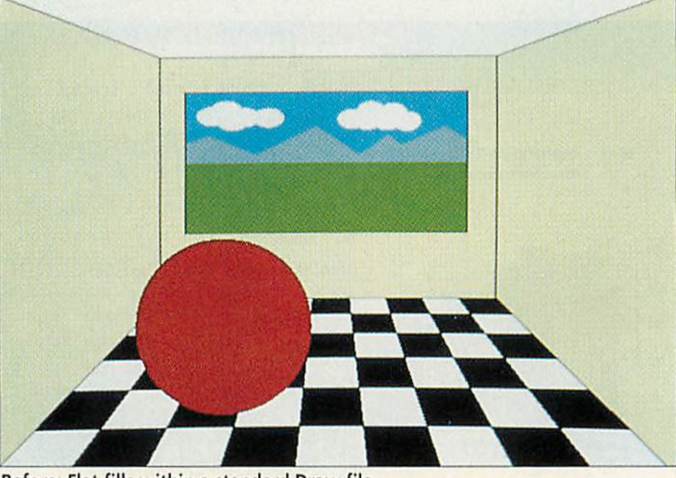
TRUE COLOURS

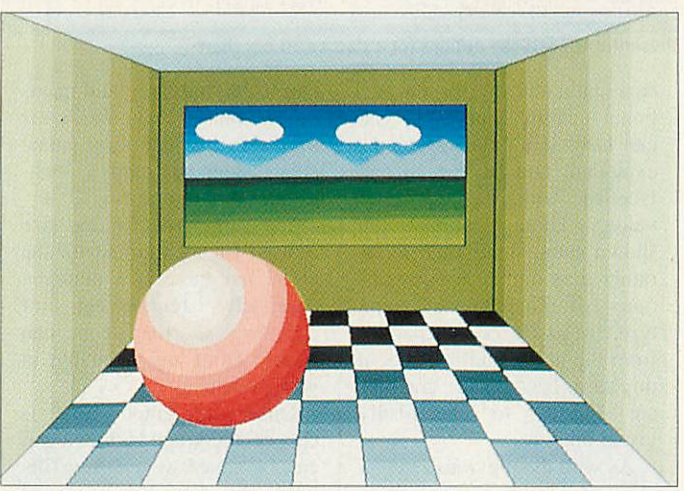
Because it is a colour-orientated program, much thought has gone into colour selection. As well as the usual colour sliders similar to those in *Draw*, *Chameleon 2* also has 256 grey, 256 colour and 16,777,216 (24-bit) colour palettes. The 256 grey and colour palettes are both laid out in a sensible way, making different shades easy to select.

The 24-bit palette displays a 256 × 256 grid of colours, showing one 'slice' out of a colour cube. Imagine looking directly down on the cube where the three axes represent the levels of red, green and blue (see our colour cube diagram on the following page).

The colour in the bottom, left-hand corner would contain black because the levels of red, green and blue are all zero. The diagonally opposite corner would contain white because the levels of red, green and blue are all 255 (in other words the maximum levels).

Chameleon 2 displays a horizontal 'slice' through the colour cube which can be altered by moving a slider to control the amount of red. The full range of green and blue levels are always displayed.


Before: Flat fills within a standard Draw file


After: Giving it the 3D treatment using the various fills provided in Chameleon

THE SOLID FACTS

The first release of *Chameleon* only included the ability to change solid areas of colour, but the new version also allows any shape to be flood (or fountain) filled with a definable colour scale.

Although *Draw* is an excellent program for designing diagrams and small pictures, it does not lend itself very well to the creation of detailed and highly-coloured works of art. In order to get any depth in a picture, a degree of shading is useful to highlight various areas, making them stand out and giving the objects a solid appearance.

If, for example, you wished to draw a ball, a highlight at the critical point would give the picture a far more realistic appearance. Many currently available bit-map art programs contain shaded flood fills that can be used for this purpose, but *Chameleon* provides the first chance to do this with *Draw* files.

Four types of graded fill are available; one colour to another, one colour to another and back to the original colour, circular, and elliptical. Each fill is easy to implement – first, select the two colours you wish to 'shade' between and then indicate on the picture where the fill should be. A moveable arrow indicates the direction of the fill.

Once you are happy with your picture, the results can be saved as straight *Draw* files, or as cyan/magenta/yellow/key separations for professional printing.

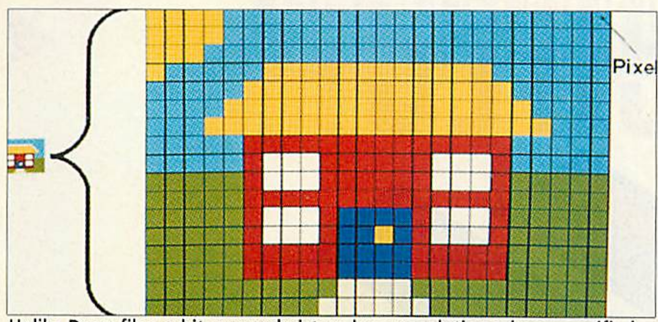
DESIGN TECHNIQUES

There are two techniques used for designing pictures on a computer: bit-map and object-orientated.

As *Chameleon 2* deals with *Draw* files, which are object-orientated, it falls into the latter category. An object-orientated picture is completely different to a bit-map picture. It consists of a series of shapes such as squares, rectangles and circles, that can easily be altered. This is achieved by storing the picture as a description of these objects; what they are, where they go, what their colour and size are, and so on.

Because of the geometrical nature of object-orientated pictures, enlarging them makes no difference to their quality. If, for example, you had a picture of a circle and wished to double the size of the circle, the 'description' of the size of the circle is multiplied by two

Compare this scenario with a bit-map picture which, as its name suggests, is a rectangular grid of any size, where each



Unlike Draw files, a bit-mapped picture loses resolution when magnified

point on the grid holds a particular value relating to the colour of that pixel. A pixel is a single point in a bit-map picture. The amount of memory required to store a bit-map picture increases directly with its size and the amount of possible colours that can be used.

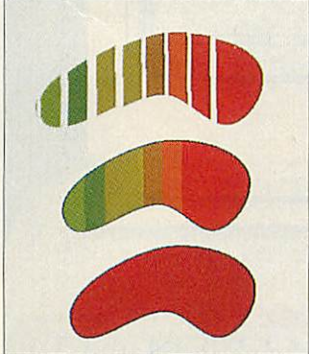
The quality of a bit-map picture depends on the resolution (number of pixels) in the design. Enlarging a bit-map picture gives it a 'chunky' appearance as shown above.

FOUNTAIN FILLS

Most pixel-based art packages contain an option for filling an area with a particular colour or colours. A number of fills exist, including, flood fill (changing the colour of a particular area to another), graded fill (filling an area with a range of colours between two preselected colours), graded radial fill (filling an area with a group of concentric circles).

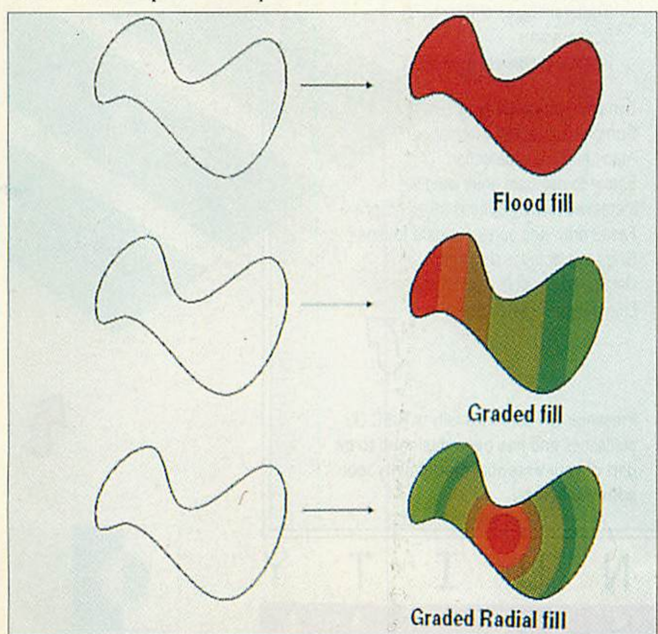
Fills are often referred to as 'flood' or 'fountain' fills, because of the way that they start from one point and spread out from there. There is a large difference between bit-map fills and the object orientated fills provided in *Chameleon*.

Any type of fill used for changing the colour of a bit-map shape is just a case of changing the colour of the pixels. Obviously, a graded fill requires a little more thought,


The components of a fountain fill

but the idea is basically the same. In an object-orientated shape fill, the difference between normal fills and graded fills is considerable. In the case of a normal fill, all that needs to be done is to make a note that the colour of an object has changed. A graded fill, however, requires a series of new objects to be generated; each one being coloured accordingly and each one fitting correctly into the original shape.

The diagram shown below shows the various stages involved: an original object, the object coloured with a graded filled, and the new shapes used to 'create' the fill.



Three types of fill are available within the program

In order to get a smooth grade from one colour to another, a large number of strips have to be created. The smoother the graduation, the more strips have to be created and the more memory will be required to store the object.

One way around this is to have a special extension to an object's colour description, indicating that it is filled with a range of colours rather than just one. All that needs to be stored is the start colour, the end colour and the two points that the fill is between. The program that actually renders (displays) the object will produce its own on-screen fill. This greatly reduces the amount of memory required to store such an object.

Unfortunately, *Chameleon 2* cannot capitalise on this method because the current *Draw* format does not include graded-fill objects. (One package that uses this method is the Computer Concepts' *ArtWorks* package, which will be released shortly.)

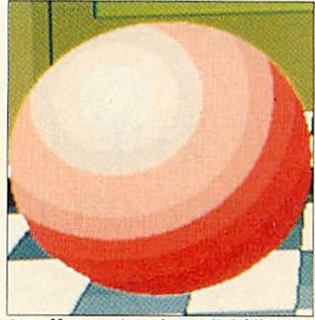
24 BIT PRINTING

As we mentioned earlier, *Chameleon 2* uses 24-bit colour. But, at present, there is no direct support for printing 24-bit images in Risc OS. With the move towards both hardware and software support for 24-bit colour, the ability to print in full colour is an important factor.

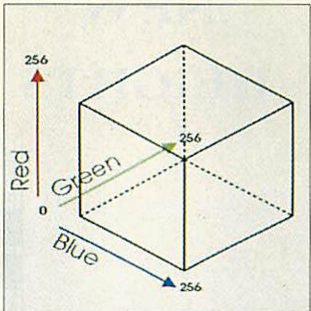
Files can be exported from *Chameleon 2* as colour separations (cyan, magenta, yellow, key) for printing out professionally. Alternatively, a print option does exist in the program, although this is limited to using the existing Risc OS printer drivers. Ace Computing (which produces *Euclid* and *Mogul*) is working on a driver for printers and this is likely to be supplied with the *Chameleon 2* package.

CONCLUSION

In use, *Chameleon 2* is extremely easy to operate. The layout of the tool-boxes is clear and informative, with a small window indicating what tool is currently chosen. Filling an object is just a case of selecting a colour (or two colours in the case of a graded


3D effects using the radial fill

fill) and pointing at the shape to be altered. Like any program that works alongside others on the desktop, it benefits greatly from the extra speed of an Arm3 processor. It is likely that you'll want to run *Chameleon 2* in a 256 mode,



The RGB cube for choosing colours

especially when graded fills are used. The time taken to redraw a picture increases quickly in such cases.

The first release of *Chameleon* was an excellent addition to *Draw*. Now with its advanced fills, *Chameleon 2* is an essential purchase for those who wish to produce more colourful and realistic images.

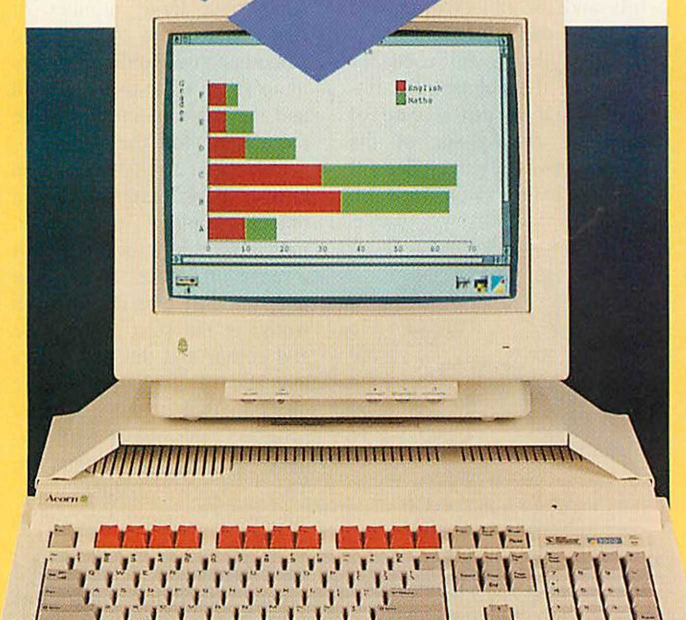
PRODUCT DETAILS

Product: Chameleon 2
Supplier: 4Mation, 14 Castle Park Road, Barnstaple, Devon EX32 8PA.
Demo: Send a 3.5in disc to the above address for a free demo of the program
Tel: (0271) 25353
Price: To be announced
Machines: All Risc OS machines



presenter gti

THE PRINCIPLES OF PRESENTER TAKEN TO NEW HEIGHTS



Following extensive research amongst Presenter II and Hotlink Presenter users, Lingenuity is delighted to introduce Presenter GTi.

Generating a vast range of graphs and charts has never been easier. Data is entered and edited via a simple worksheet, and all graphs can be saved as genuine draw files and/or transferred into other applications.

Presenter GTi's Hotlink option gives the user the ability to communicate with other applications such as Pipedream 3 - allowing relevant data to be updated continuously for the displayed graph.

EXISTING PRESENTER FEATURES:

- Bar, Line & Pie charts
- 3-Dimensional displays
- Auto scaling
- Fast Hotlink transfer
- User definable layouts
- Full colour or monochrome graphs
- Supports CSV file format for loading and saving data

NEW GTi FEATURES:

- Multiple Pie chart display
- Logarithmic axis scaling
- Regression line (Line-of-Best-Fit) data available: Constant, Gradient, t ratio, Residual value, R^2
- Function key short cuts
- Zoom option for graph display
- Multiple document capability
- Multiple view option
  - File Information box
  - Instant display of saved graphs

ENHANCED GTi FEATURES:

- Wider range of Graph types:-
  - 8 different types of Bar charts
  - 4 different types of Line charts
  - 3 different types of Pie charts
  - Scattergrams
  - 2 different types of area chart
- Dynamic worksheet area.
- Comprehensive file information
- Auto Label/Data detection
- Easier-to-use data entry window
- Increased display options for all graphs
- Faster draw and screen update routines
- Grids available for all graphs
- Data point symbols - selectable
- Line patterns - selectable

Presenter GTi conforms fully to RISC OS guidelines **and has been designed to be part of your essential productivity tool software library.**

NEW·NEW·NEW

PRESENTER GTi - £69.95
(UPGRADE FROM PRESENTER - £30)

OFFICIAL EDUCATION ORDER - £62.95
SITE LICENCE - £170 + £5 PER COMPUTER
(UPGRADE SITE LICENCE FROM PRESENTER - £50)

PRICES DO NOT INCLUDE VAT.
(POSTAGE - £1.50 EXTRA)

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GREY DAYS

The new professional scanner from Computer Concepts aims for quality reproduction. Graham Bell puts it to the test

SCSI is the ace in the pack of expansion cards: it can connect up hard discs, CD Rom drives and other peripherals. But Computer Concepts' Scanlight Professional is the first scanner to use the SCSI bus on the Arc. It's based on the Taiwanese-made Umax UG80, a mid-range flatbed model. The other vital statistics include A4-size, 300-dpi, 8-bit greyscales, with the illumination provided by a white florescent lamp and the sensing done by a CCD strip.

USING THE SCANNER

The scanner can be supplied with a Morley 16-bit uncached SCSI card, unless you already have an interface. There should be no problems attaching it to existing SCSI cards, as they are all fairly similar and the SCSI software only differs in minor ways.

The only real drawback of this model is that the lamp can not be software controlled, so you should avoid leaving the scanner on for long periods of time. You *can* switch it on and off without upsetting the SCSI software in the Arc, but it's not an ideal arrangement. Another negative point, which detracts somewhat from the professional label, is that the SCSI identity number can only be changed by opening the case and using a Dip switch – the manual is no help here.

Scanlight Professional can scan at a full 300dpi and 256 greys, although you can also set the software for a lower resolution or fewer greys. Although the machine doesn't multi-task during scanning, the software is easy to use, and the scanner itself is quick – under 30 seconds for an A4 high resolution page. You just toss your photo on the glass, close the cover and press the button.


An important factor is the ability to reproduce subtle grey tones

The raw scans are extremely good, albeit a touch over-toasted, but that's simple to correct with the Scanlight software. And because of the white lamp, they don't suffer drop out problems with coloured originals as scanners using LED illumination do.

After scanning, the second half of Scanlight comes into play – the image processing. There is a toolbox which allows you to alter the tones, rotate the image, sharpen the scan, remove speckly noise and so on and the results you get are rather impressive. A combination of overall lightening and a touch of sharpening certainly enhanced the look of scans from the Umax.

However, the tools are not easy to use. Criticising the image processing may seem churlish, as it is not provided with other Arc scanning software, but... the grey map editor is fiddly to use with the mouse, whereas the lighten/darken buttons and the effects of most convolutions are too severe for anything but special effects.

CONCLUSION

Scanlight Professional really is a professional-level tool. This scanner gives you the necessary 256 greys for high-quality reproduction of half tones, plus enough resolution to allow a little enlargement.

It still has a few rough edges, but is as good as the equivalent scanners in the PC and Mac world and at a very competitive price.

Scanlight Professional produces reliably good results. Check out this scan of a ruler – those are 64ths of an inch

FADE TO GREY

All of the existing Scanlight scanners can produce 256 levels of grey. But most of their models are actually 16-grey scanners, and the extra greys are created by averaging (or re-sampling) so reducing the resolution by three quarters.

However, Scanlight Professional can produce 256 levels in the first scan, but is not without its drawbacks. One is that you can't display them – the Arc video hardware is limited to 16 greys. Impression and Scanlight both use dithering to get a better display, but loading a scan into Paint produces a parti-coloured mess. And printing to anything except a Postscript printer gives only 64 greys on paper. Finally, an A4 page scan takes up 8Mb. But if the price tag doesn't put you off, then you're unlikely to be worried by any of this.

PRODUCT DETAILS

Product: Scanlight Professional (plus optional SCSI card)
Supplier: Computer Concepts
Tel: (0442) 63933
Price: £719, £799 including SCSI (prices exclude VAT)

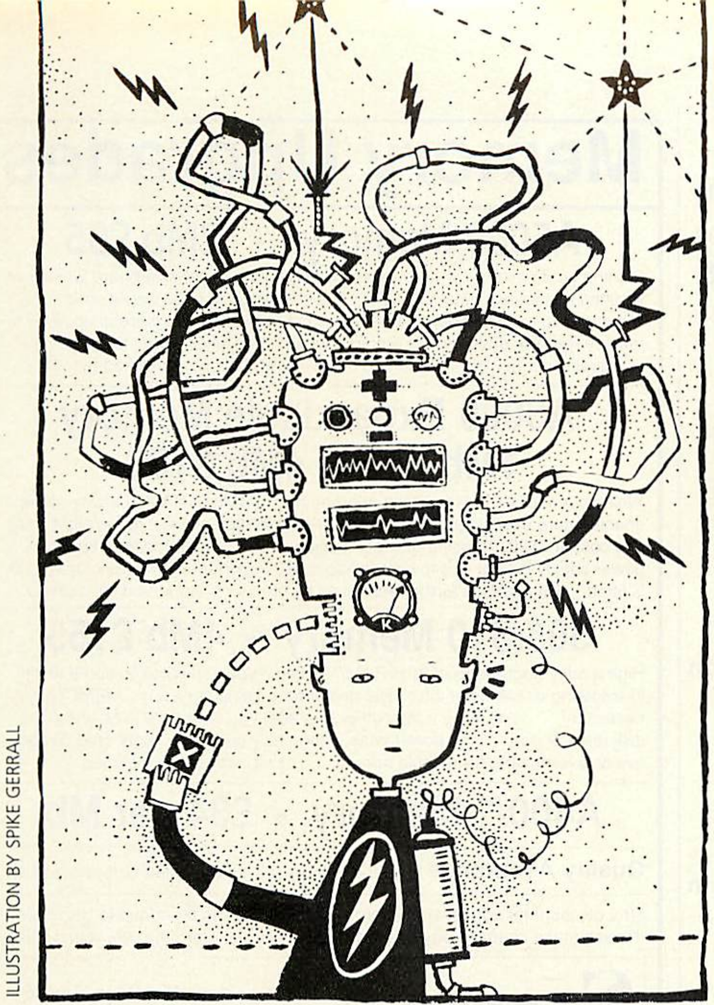


ILLUSTRATION BY SPIKE GERRALL

GOOD MEMORIES

The A5000 is the latest recipient in the demand for memory upgrades. Dave Lawrence looks at some of the contenders

As the saying goes, you can never have too much of a good thing. And one area where this seems to be particularly true is computer memory.

There is a fairly constant user demand for more Ram upgrades for the Archimedes. But new A5000 owners come across one hurdle in their quest for more memory.

There is only one surface mount memory controller (MemC) on the main board and only one expansion slot. Because a MemC can only handle up to 4Mb of memory, this effectively limits the A5000 to 4Mb.

Upgrades beyond 4Mb are possible, but require this MemC to be removed and incorporated into a design with more MemCs. At present, this will invalidate your machine's guarantee from Acorn. Future warranties from Acorn may well allow boards to be fitted by approved dealers, thus keeping your guarantee intact.

We decided to put a selection of 4Mb boards to the test. All boards are easily installed, requiring only a screwdriver to undo the case. Also, a pair of long nose pliers could be handy to enable a link, which is located slightly under the hard drive of the machine, to be fitted onto the main board.

WATFORD, £95

Watford Electronics' card is larger than some (Eurocard size) and so the backplane assembly needs to be removed. Two plastic pillars are supplied to support the right hand end of the board, holding it firmly in place. Surface mount technology is used throughout, two rows of eight memory devices are used and there is an empty row ready for the extra 1Mb when Acorn brings out a 1Mb base machine.

The board is four layer, with a full ground plane to ward off nasty electrical noise. A very nicely designed board. Tel: (0923) 37774.

VERTICAL TWIST, £109

As the name implies, this is a vertical card rather than a horizontal board, although there's nothing you have to twist. Because it is vertical you do not need to remove the backplane to install it. Conventional memory devices are used (not surface mount) in one row of 12 and one of four. The other eight holes allow for a 1Mb to 4Mb card with the same board. The board is four layer, although there is no ground plane. Instead, it uses a matrix or grid design which should provide adequate protection. A very easy to install board. Tel: (0373) 824200.

SIMTEC, £95

Simtec also employs a vertical design. Its card is slightly wider and not as tall as Vertical Twist's – in fact, it is only just larger than the 16 conventional devices on the card. A 2Mb to 4Mb card only, Simtec will produce a separate card for 1Mb machines. Again, it is a four layer design, with a full ground plane. It was very simple to install. Tel: (0772) 812863.

RISC DEVELOPMENTS, £109

Risc Development's card is roughly the same size as Vertical Twist's (half as long as Watford's) and fits horizontally with just enough space to install it without removing the backplane. There is no support on the right hand end, but none is needed as the connector holds the card quite firmly.

As with Watford's, surface mount technology is used on a full ground-planed four layer board. There is also space on the card for the extra 1Mb for 1Mb machines. The chips are on the underside of the card. No heat problems were encountered when running the board. Tel: (0727) 40303.

ATOMWIDE, £110

This is the most expensive of the boards, but the only one to offer expansion to 8Mb. It is another Eurocard design and therefore needs the backplane to be removed and plastic supports are provided for the right hand end. There are 16 conventional memory devices used, and space on the board for the extra 1Mb.

Unlike the Watford board, the rest of the space on the card is tracked out for the extra MemC and memory required for 8Mb. If you require this, it is a dealer-only upgrade – and don't forget about your guarantee. As with the others, it is a four-layer design with full ground plane protection. Tel: (0689) 838852.

FUTURE PLANS

Watford, Vertical Twist, Simtec and Risc Developments all have 8Mb boards planned. As for 16Mb, most companies are waiting to test demand. Since all the cards tested work well within their specifications, it is hard to indicate a clear winner among them. And since prices are so close, you will probably make your choice based on company reputation.

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● Find out how passing on the tape to a potential Acorn Learning Curve system purchaser could entitle you to substantial discounts on software

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Remove the cassette from the cover of this month's issue and place it into your audio cassette player. The inlay card in the cassette case contains all the details of this special Acorn promotion and how to take advantage of the offers.

If you currently own an Acorn Learning Curve system, you won't need us to tell you how good it is. But, to encourage more people to join the growing number of Acorn users, Acorn has produced a special audio tape, which you will find exclusively on the cover of this month's *BBC Acorn User*.

On **Side One** you can hear all about the latest Acorn developments, in particular the new A5000 computer, as well as useful hints and tips, reviews of new software (including an interview with *BAU*s games editor, Sam Greenhill) and more.

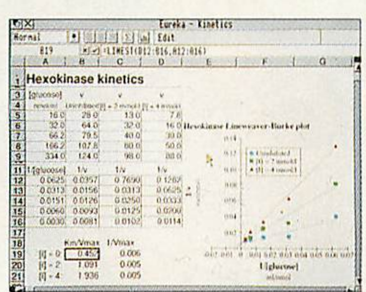
On **Side Two** there is a non-technical introduction to the benefits of owning an Acorn Learning Curve system, aimed at potential newcomers to the world of Acorn.

As a current Acorn Learning Curve owner, if you pass on the tape to a potential new purchaser, and that person buys a system, you will be entitled to some exceptional software discounts, or free software worth over £100.

For the new purchaser, there is also the chance to obtain a **FREE** six month subscription to *BBC Acorn User*, and other benefits, including a free game and low-cost finance on the purchase of the machine.



Artworks provides exciting graphics



Calculate using the Eureka spreadsheet



Excitement in space with Elite

By passing the tape on to a potential purchaser of a new Learning Curve (A3000 or A5000) system, you will be entitled to choose from one of the following incentives:

● £100 off Computer Concepts' *Artworks* graphics or *Impression 2* desktop publishing packages, plus a free Thesaurus worth £39

● A FREE copy of Icon Technology's *Easi Writer* word processing package

● £99 off Longman-Logotron's new *Eureka* spreadsheet package, plus a free copy of *Junior PinPoint* worth £24.95

A new purchaser who buys an Acorn Learning Curve as part of the promotion will receive:

● A FREE six-month subscription to *BBC Acorn User*, including a monthly disc (worth over £10)

● Low-cost 5 percent finance on your purchase over 12 months (written details available on request from Acorn Computers)

● A FREE copy of the 3D space adventure game, *Elite*, from Hybrid Technology

This special promotion is being organised by Acorn in conjunction with its nationwide network of specialist dealers. Just listen to the tape and read the supplied information on the inlay card – and find out how you and a potential Acorn computer user can benefit.

The closing date for the promotion is December 31 1992 and is open to private purchasers of Learning Curve systems only. Please direct all enquiries to Acorn Computers, Fulbourn Road, Cherry Hinton, Cambridge. Tel: (0233) 245200.

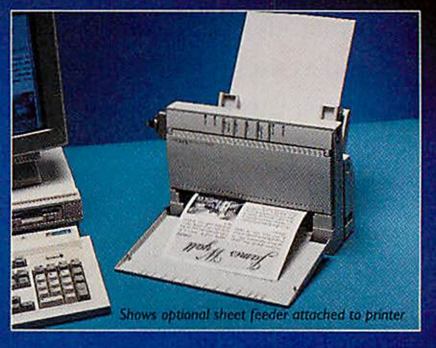
THE DRIVING FORCE



Winner of the Best Printer in the recent Computer Shopper Awards, the Cannon BJ10ex printer has revolutionised the small printer market. It offers 360 dpi, near laser printer quality, on plain A4 paper, in an incredibly compact and lightweight housing. Unfortunately the existing RISC OS printer drivers, based on the standard Acorn drivers, have definitely been in the slow lane, locking your computer up for the entire print process, often up to ten minutes per page.

Computer Concepts have now created a set of RISC OS printer drivers, called TurboDrivers, that are optimised for the Cannon BJ10ex printer. The result is the perfect combination of budget printer and RISC OS printer driver, able to print full 360 dpi high resolution pages at a quality superior to that available from any dot matrix printer.

The TurboDrivers not only print the pages faster, but give control back sooner - up to ten times quicker. The table shows the time taken to print and the time the computer is occupied for some typical example pages.


Shows optional sheet feeder attached to printer

The TurboDrivers print faster on an ARM2 machine than traditional drivers on an ARM3 machine. In addition they can send the print data to disc and then print from disc in the background, so the computer and almost all memory remains free for other uses, while the printer gets on with printing.

	Standard Driver	TurboDriver	
	Time to complete	Time to complete	Time to get control back
A complex page of text & graphics	521 seconds	199 seconds	70 seconds
2 pages text in different fonts	753 seconds	283 seconds	64 seconds
One complex page from !Draw	643 seconds	261 seconds	187 seconds

All times in seconds from a standard ARM2 Archimedes with 4MBytes RAM and hard disc. Times would be faster for an ARM3 based machine.



BJ10ex printer & drivers £249.00 + VAT (£292.57) + p&p. Optional 30 sheet feeder £48.00 + VAT (£56.40)
TurboDriver software & printer cable £49.00 + VAT (£57.57)

Compatible with all applications that use the RISC OS printer drivers and all Archimedes models.



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GAME SHOW

A whole host of new games – including one for the BBC B – have popped up this month. *Paradox*, reviewed on the next page, is the first game this year for the Beeb and its launch could not have been more aptly timed, with the decade of the BBC micro being celebrated this month.

Publisher, The Really Good Software Company believes that there is plenty of life in the old machine yet. Maybe so, but the BBC eight-bit games world is going to need a bigger boost than a single game and the best bet for Beeb owners still seems to be Superior Software's *Play It Again Sam* series. While, I wish *Paradox* well, it faces a daunting task.

On the Risc OS front, the French company, Eterna, has just completed a revamp of its games selection to make them work on the new Acorn A5000 computer. Due to the slightly different way in which the A5000 manages itself, many companies are doing the same. In fact, the games just need a bit of 'tweaking'.

Of course, this can only be performed on new stock, prompting The Fourth Dimension to announce last month that all its games have now been tweaked, and the company has come up with an offer of replacement discs for disgruntled A5000 owners.

Eterna has made similar pledges, promising to send special conversion discs to anyone experiencing difficulties. To acquire one, send your name and address to: Eterna, 4 rue de Massacan, 34 140 Vendargues, France, specifying which game you have, unless it is *Cartoon Line*, in which case you must also enclose Disc One. Eterna's schedule is taking the form for new releases that will be ready by the *BBC Acorn User* Show in October, comprising what Eterna's managing director, François Eves-Bertrand, terms as 'only really big games'.



Paradoxically, there's a new game for the good old Beeb

The first to hit the streets will be *The Thing of Darkness*, a fantasy role-playing game with over 3000 locations. This will be followed by some sort of space adventure (as yet anonymous) described as a 'save the universe' game with *Zarch*-style graphics. The third title is to be a platforms game, similar to one called *Bubble Bubble* on other computers.

Superior Software is putting the final touches to the Risc OS version of *The Last Ninja*, which was a huge success on the BBC micro when it was released two years ago. The new version, which will run on all BBC A3000, Archimedes and A5000 machines, is not simply a conversion of the BBC game, but has new maps and puzzles and some extra places to visit as well. Expect it to be available next month.

Superior Software is also drawing up plans for a new series of *Play It Again Sam*, but this time for the Archimedes. The original Beeb series is presently at *Sam 16*, and has been enormously successful. It relies on Superior's tried-and-tested format of bundling four games for the price of one. The series is particularly popular with those who have only just bought their BBC computer, since it gives them a chance to buy games that were hits a few years ago. So far compilations have tended to include one of Superior's own 'blasts from the past', two old games from other software houses and often a brand new one from Superior as well.

This approach could prove equally popular on the Archimedes, giving brand-new users on the Arc the chance to catch up with a lot of good games. *Play It Again Sam 1* for the Arc will be out by early summer and there will be at least one more compilation released before Christmas. Both will contain four games and will retail for less than £30.

Cambridge International Software will shortly be releasing some extra courses for its golf game *Microdrive*. It also offers improved control of the golfer, making the simulation far more realistic.

Also from CIS is a reincarnation of one of the first games I ever played in the arcades. I used to shove as many 10p coins into the machine in my local fish and chip shop, as I handed over the counter for chips. The offending program, *Mr Do*, sometimes known as *Mr Ee*, was an original and is now a classic, involving a little wizard and an edible labyrinth full of fruit and nasties. On each of the sixty levels, the object is to eat all the cherries and avoid the fires that chase after you. The release of CIS's version – which has a built in level designer – may attract a large nostalgia following and will also appeal to newcomers.

Finally, Tim Major and Steven Darby from Guisborough in Cleveland have sent in a tip for boosting your score in *Boogie Buggy* from The Fourth Dimension. In the game, the hero is a dodgem car who must save the city from evil. Select the lower-central swamp zone from the Dodge City map and then play to collect the chainsaw (the thing that makes Boogie's nose look like a painfully inflated cactus). Continue by driving down to the pond where the bats fly, and jump up and down to give an unsuspecting bat that Texas-touch.

Bats are, of course, blind so they keep on coming, oblivious to the perils of *Boogie* and her chainsaw, causing your score to take an upward turn. From a distance the oncoming bats probably think it sounds like an estranged dodgem car wielding a deadly chainsaw, but then fly on when they realise what a daft notion that is...

Sam Greenhill

X-FIRE

The Fourth Dimension
Tel: (0742) 700661
All Risc OS machines
£24.95

You are smoking the heinous weed of Essex. Armed only with photon torpedoes and a few good lines, you must sit around in the *Dog and Duck* of Dimension X. You have meditated all your life, for this day. Wielding only your particle nobblers, you're on the garden fence between mild irritation and a bunged up nose...

So begins one possible setting for this game, made up from the 'scenario-you-like' page in the instruction booklet – and there are many thousands of others.

But in practice, *X-Fire* for the BBC A3000 and Archimedes is a shoot-em-up game, and not a very good one at that. The battleground essentially consists of a grid of paths along which you, the enemy, may travel or shoot. Blocks, arranged to make up the grid, begin as boring squares and progressively become more interesting, representing clusters of cola cups or floral decorations. But they are still square, still form a two dimensional grid and, after a while, have a tedious, repetitive air to them.

You control a spherical space ship that moves clumsily between the blocks, shooting at enemy units. These range from the Henry bug (easily dealt with), rockets that zoom along the paths laying mines, and posses of tortoises that stumble after you and can take some determined shooting!

Bonuses exist in many forms but each only lasts for ten seconds, which I found irritating, since you have to keep an eye on the small red countdown while you play. You can fire a machine gun in all directions for ten seconds, but you can only fire when you are stationary. The enemy seems quite adept at staying conveniently out of range,



Caught in the X-Fire – but adrenalin pumping effects are few

while your ship stands in the corner, exploding like a self-combusting bag of marbles. Not the most dignified of attacks, methinks.

The graphics are not bad but the advertised 300k of sound is not that impressive. I could quite easily live with this, but my problem is that *X-Fire* is not particularly challenging. Adrenalin pumping effects are few and the tacky keyboard response, due to the grid system and the fact that you are forced to move an entire block at a time, is annoying. Difficult it can be, but the 'traditional arcade values' mentioned on the box are not quite the ones that I remember.

Sam Greenhill

PARADOX

TCA
Tel: (0582) 761385
BBC B/Master/Compact
£14.95 plus VAT
(£15.95 for 3.5in disc)

Paradox is the first new eight-bit BBC game to have emerged for some time and features fifty screens of puzzles, plus what is possibly the most ridiculous background story ever woven around such a simple game.

The craft, which looks like the Liberator out of *Blake's 7*, is controlled through areas of space surrounded by asteroids. All you have to do is find and shoot the asteroids until they are hot enough to extract an ore from, before making your escape. However, things are complicated by the fact that someone has spread girders, dynamite and transporters everywhere else.

Your path to the asteroids is hindered by these object, plus a few slippery zones. There is a lot of animation in the launch



Plenty of screen puzzles in Paradox, but questionable background story

sequence and on the loading-screen which, after a while, begins to irritate.

The real challenge is to finish each level in the savagely short time you are given, using a selection of eleven game objects. A scanner in the top left of the screen allows you to keep tabs on where you are, in relation to your goals, and also shows the location of any flying nasties you might encounter. Graphically it's great, with four levels of parallax stars moving in reaction to your thrust and the music is some of the best I've heard on the Beeb. There's also a good atmosphere of running against the clock and the presentation is immaculate. But, the real problem lies in the game's playability. Your craft is not manoueverable enough (a Left, Right rotate and Thrust system of movement would have infinitely improved the game play). Also, it takes a good twenty seconds to sufficiently heat up a rock, which puts a dampener on adrenalin.

In my just-finished version there were still bugs a-plenty: some girders seem to do no harm, while others are impassable. Logic puzzles on later levels are intriguing but, in general, objects are not packed densely enough for a proper cerebral challenge.

Perhaps my expectations have been raised by over exposure to the Archimedes, but surely Beeb games in their heyday were better than this? This isn't really 'a new high' in eight-bit games, as the writers claim, but it is adequate fare for games-starved Beeb owners.

Mat Tizard

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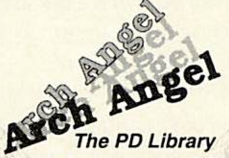
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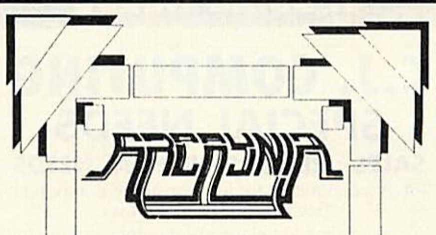
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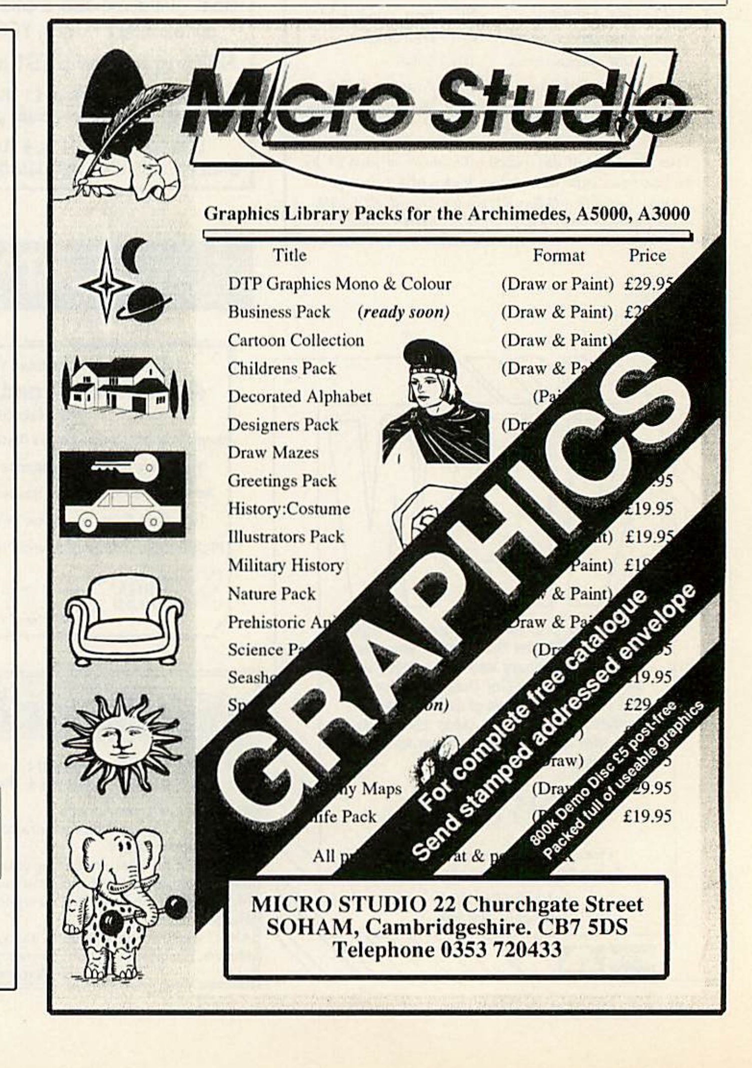
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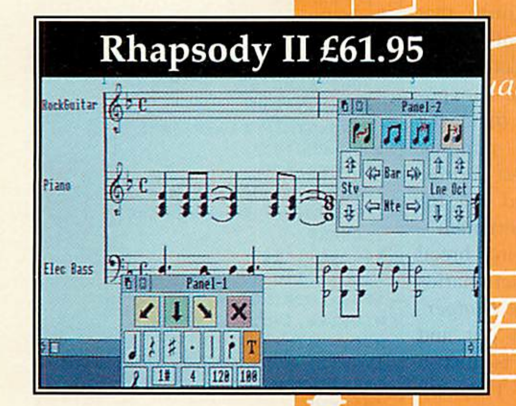
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Rhapsody II £61.95



Clares bring you a range of music software that is fast becoming the standard on the Archimedes.

Rhapsody II is a music notation package that allows you to write and modify musical scores. It is to music what a word processor is to words.

The notes can be entered by hand or, using a Midi keyboard, they can be captured in real time or step time. Once the music has been captured you can edit it, transcribe it, add lyrics, repeats, trills, slurs etc. You can transpose the score or just parts of it, you can play it back through Midi, you can even use it as an unpaid accompanist to your practice sessions. Most importantly you can print your finished score using any printer and RISC OS printer drivers. Quite simply, Rhapsody II lets you get back to the music AND gives you time to enjoy it. Many users wonder how they ever managed without it! Ask us for a demonstration version today.

Vox Box £61.95

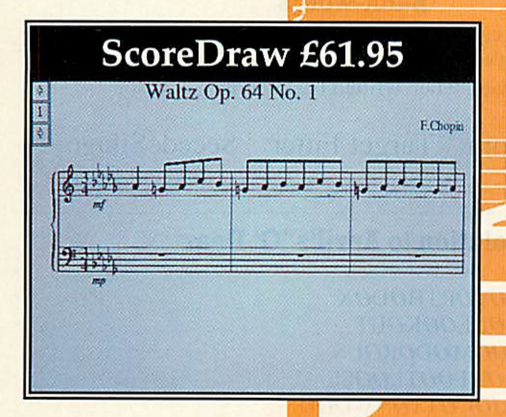
Vox Box is a supporting package for Rhapsody II and consists of four programs. The first, *Perform,* allows you to play Rhapsody II scores, Armadeus samples and Midi files. You can have a continuous performance of your compositions.

VoxBeat is an application to turn sampled percussion sounds into a useful voice module that provides realistic percussion accompaniment to your scores.

VoxSample converts sound samples into usable Archimedes voices. You control which part of the sample is used to create the voice and you can also define the sound's envelope. The resulting voice module is much smaller than the original sample and sounds much better.

VoxSynth is a more complex application that enables you to digitally synthesise voices for use in the Archimedes. Voices are produced by drawing waveforms or harmonics. You even have a form of FM synthesis available. *VoxSynth* is also useful in the science laboratory as it deals with waveforms, harmonics, FFT and FM synthesis.

ScoreDraw £61.95



ScoreDraw is another support program for Rhapsody II. It produces high quality printout of music scores. Together *Rhapsody II* and *ScoreDraw* form the heart of a complete Archimedes based music publishing package. *ScoreDraw* takes a score from *Rhapsody II,* or the original *Rhapsody,* and converts it into a series of Draw files. The results are of true professional publishing quality – especially when printed on a laser printer.

ScoreDraw has its own library of music symbols and it uses these to construct a high quality score. Any text within the score is converted into user selectable outline fonts, if they are available. An additional user library is also supplied which provides items such as hairpins and grace notes.

In addition to improved print quality *ScoreDraw* also concentrates more on the formatting of the score. Because the score is handled differently and *ScoreDraw* is not required to 'play' the score it can spend more time on good presentation.

And there's more... Look out for two more music packages coming from the Clares stable soon. And don't forget our Armadeus Sound sampling board if what you are interested in is recording and manipulating sound rather than music.

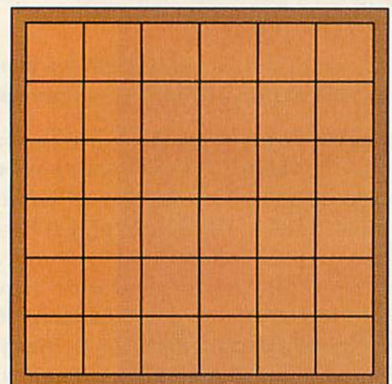
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£25 Prize – Six Appeal

Below you will find six clues. The answer to each clue is a six letter word. Having found these six words, arrange them on the six-by-six grid shown. Each word appears once from left to right and once from top to bottom. The finished grid will be symmetrical about a diagonal.

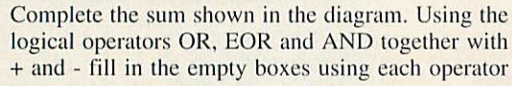


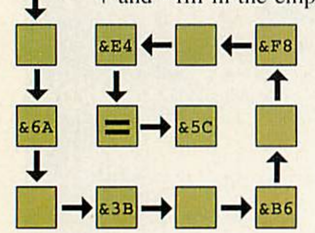
To give you a little help, here are the letters used in the final grid: Ax3, Cx2, Ex2, Kx2, Lx3, Nx2, Ox4, Rx4, Sx6, Tx7, Yx1.

The clues are:

1. Speaker
2. Emphasize
3. Despot
4. Animals
5. Hillocks
6. Supplies

Hex-travaganza





Complete the sum shown in the diagram. Using the logical operators OR, EOR and AND together with + and - fill in the empty boxes using each operator only once. The equation, when followed according to the arrows, should balance. By the way, intermediate results are all in the range &10 to &FF.

Solution to March 1992 Prize Pathword

CODE, CODES, COME, COMER, COMES, COMET, COMP, COMPEER, COMPETE, COMPETED, COMPETES, COMPUTE, COMPUTED, COMPUTER, COMPUTERISE, COMPUTERISED, COMPUTES, COPE, COPED, COPER, COPES, CREE, CREED, CREEP, CREES, CREME, CREPE, CREST, CRESTED, CRIES, CRIME, CRIMP, CRIMPED, CRISE, DEEM, DEEP, DEER, DEME, DEMIREP, DEMISE, DEMIST, DEMISTER, DEMO, DEPUTE, DEPUTES, DESIRE, DETER, DOME, DOPE, DOPER, DOPES, DUES, DUET, DUPE, DUPER, DUPES, EMEU, EMIR, EPODE, ESTER, ETUDE, IMPED, IMPUTE, IMPUTED, IMPUTER, IMPUTES, MEED, MEER, MEET, MEETS, MERC, MERI, MESE, METE, METED, METER, MIRE, MIRES, MISE, MISER, MIST, MISTED, MISTER, MODE, MODEST, MOPE, MOPED, MOPER, MOPES, OMER, OPED, OPES, PEED, PEER, PEES, PEISE, PEISED, PERI, PERM, PERMED, PEST, PESTER, PETER, PETS, POME, PUTS, REED, REEST, REIS, REIST, REMISE, REMISED, REPO, REPUTE, REPUTED, REPUTES, RESET, REST, RESTED, RESTEM, RETE, RETS, RIEM, RIME, RIMED, RISE, SEED, SEEM, SEEP, SEER, SEME, SEMI, SEMIE, SEMPER, SETUP, SIMP, SIMPER, SIRE, STED, STEED, STEEM, STEEP, STEER, STEM, STEME, STEMED, STEP, STUD, STUPE, STUPED, TEED, TEEM, TEEMS, TEER, TEES, TEME, TEMED, TEMP, TEMPED, TEMPER, TEMPO, TERM, TERMED, TERMI, UDOMETER, UPCOME. There are 166 words in total.

The winner was **Peter Mabey** of Harlow in Essex who, after adjudication, was found to have 140 words. Only words found in Chambers English Dictionary (1988) were permitted. Accented words were allowed, but not hypenated ones. We said no plurals and disallowed *uteri* as well as those ending *-s*. Thus, all words ending *-s* above also have verb forms. To avoid any misunderstandings in future puzzles and unless we specify otherwise, the following rules will apply: 1. No plurals formed with *-s*. 2. No proper nouns. 3. No hyphenated words. 4. No abbreviations (although accepted shortened forms are permitted).

The Man With The Golden Pencil

In these days of pot-holing, scuba-diving and paragliding, there is perhaps one pastime that stands out above all others, by the rugged determination of its fearless exponents. Not for them the tame thrills of jumping from the Humber bridge on an elastic band. No, for these are *true* sportsmen – the last of a dying breed whose pocket dictionaries have had the page *Danger-Daredevilry* torn out and for whom fear is just a four-letter word. They are the train-spotters. It is our honour and our privilege to acknowledge the achievements of this brave band with the latest state-of-the-art computer simulations (shown above). For us, who can only dream of train-spotting for real, this small program can provide a tantalising glimpse of the jetsetting lifestyle of those who tread the grey and endless platforms with seemingly no more trepidation than someone awaiting the arrival of the 9:15 arriving from Basingstoke.

```
 10MODE7
 20DIMe(7),s 16,d 16,t 5^5
 30REPEATVDU30
 40FORi=0TO7
 50j=i+8*e(i)
 60d?j=-(RND>0)
 70s?j=RND(6)
 80a=t+j*180
 90$a=STRING$(179,"=")
100u=RND(4)*8
110FORk=0TOu
120a?(d?j*(178-u)+k)=
(47+RND(10))OR(k MOD4=0)
130NEXT
140a=t+i*180
150q=s?i*d?i
160$a=STRING$(s?i-q,"=")+
MID$($a,1+q,179-s?i)+
STRING$(q,"=")
170e(i)=SGNINSTR($a,CHR$TRUE)
180PRINT'MID$($a,70,40)
190NEXT
200UNTIL0
```

Such is the complexity of the simulation, it must be entered on several lines as shown and compressed using our standard function key routine (below). So sharpen your pencil and open your notepad. And as you record the numbers of the engines and carriages that thunder past, spare a thought for those whose second home is platform six and whose anoraks could definitely do with a wash...

```
*KEY0 f=PA.+4:t=f:b=&F5:REP.c=(b<>&F5):?t=-?t*NOTc-58*
c:t=t-c:x=f?-1:FOR i=1TOx-4:b=?f:?t=b:f=f+1:t=t+1:N.:f
=f+4:U.f?-3=&FF:?t=&D:t?1=&FF:?(PA.+3)=t-PA.|M
```

Function key definition to squash listings onto one line.

Back-words

The word *sender* can be found hiding in reverse inside the longer word ti*redness*. It's not the only example – which longer words conceal the following when written backwards?

RatingSenora   Target Fitter   SecedeSilage

Solution to April's 'O' Dear

OFFSHOOTORTHODOX
PROTOCOLLOOKOUT
STOREROOMODOROUS
FORENOONFOOTLOOSE
ORATORIOCOTTONWOOD
MONOTONOUSSOCIOLOGY

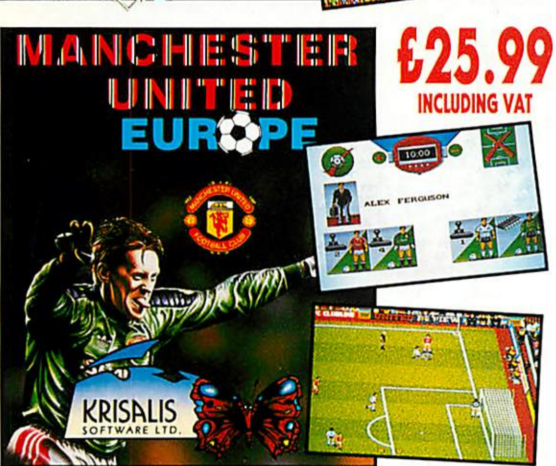
And Finally...

Seems like us Archimedes owners are being downtrodden again! The current pair of Right Guard adverts on the flickering tube state that, Right Guard's always right, even though your car's got a flat tyre, the cinema's full... or your Archimedes isn't plugged in. Being upstaged by deodorant – whatever next?

And the next scintillating experience for the Archimedes Spotters Club is never far away. It seems that there is to be an animated ham sandwich on 'Johnny Ball Reveals All' (ahem – Ed) all courtesy of Euclid and a little old Archie. ...here I am, brain the size of a planet...

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STAR PORT - A sixty screen arcade adventure, with letter-puzzle levels. Try to rescue the medical supplies from the strange, triangular, space port.

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VERTIGO - Balance your way around fifty different weird and wonderful structures to capture the diamonds. Highly frustrating and addictive.

PERPLEXITY - A 3-dimensional strategy game for all Repton and Pacman fans. Puzzle your way through 16 graphically brilliant mazes.

PIPEMANIA - The highly praised, classic, puzzle game for 1 or 2 players. Try to join the pipes and let the flooz flow, as the time runs out...

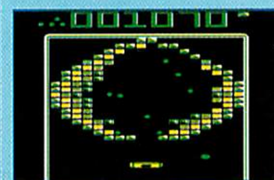
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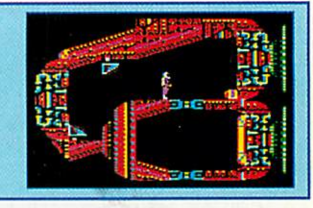
HYPERBALL - A superb 120 screen version of the classic bat-and-ball game. Includes aliens, 8-ball splitters, cannons and weapons' purchase.

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An enormous arcade adventure featuring strange alien creatures with realistic movements and actions. Pick your way through a massive, flooded cave system, solving complex puzzles along the way. Have you the skill, cunning and endurance to conquer the evil world of the Exile?



PLAY IT AGAIN SAM 15

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